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To Luigi D. Mapes
from his Grandpapa –
Oct-12th 1869.

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY:

DESIGNED AS
AN INTRODUCTION FOR STUDENTS,
AND
A CONCISE BOOK OF REFERENCE FOR PRACTITIONERS.

THE FIFTH EDITION,
(COMPRISING THE TWO VOLUMES,)
CAREFULLY REVISED AND CORRECTED.

WITH SEVERAL NEW PLATES, AND WOOD-CUTS.

BY SAMUEL COOPER,
SURGEON TO THE FORCES;
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AT CATANIA, &c. &c.

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PREFACE

TO

THE FIFTH EDITION.

The favourable reception, which this publication has met with, has encouraged me to revise the present edition with particular care. Several of the chapters in it are entirely new, as will be immediately perceived, on comparing those on the diseases of the eye and its appendages with the account of the same subjects in former editions. A chapter on amputation of the lower jaw is introduced; an operation, of which I could find no satisfactory description in any general treatise on surgery, though its performance has now been repeatedly accomplished in France, America, Germany, and this kingdom, with a degree of success that affords a convincing proof, in addition to many others, of the inestimable value of operative surgery for the cure of the most intractable diseases. I am perfectly aware, that every new operation, upon its first introduction to the common notice of the profession, is liable to be occasionally practised under circumstances not absolutely requiring it. This sometimes happens from want of discrimination, but still more frequently (I am ashamed to say) from the base motive of making the operation itself a step to notoriety and unmerited reputation. Hence, I feel myself called upon to exhort the admirers of operative surgery, and every practitioner interested in the credit and improvement of his profession, never to suffer their love of extraordinary feats with the knife, or their greedy desire of fame, to make them forgetful of the truth, that there is more real merit in removing the necessity for the practice of any one severe operation already familiarly adopted, than in the invention and performance of a hundred new ones. Let not the young surgeon be led to amputate the jaw for a disorder, with which it is often attacked, and which is well known by the name of necrosis. I believe, that no simple necrosis of it, unattended with a fungous or medullary tumor originating within the bone itself, can ever be an instance in which amputation of the lower jaw is justifiable. Very large exfoliations take place of themselves; new bone is produced, as a substitute for what is lost; the swelling, thickening, and ulcerated state of the soft parts, all disappear; and, in the end, the patient recovers without deformity, and without the agony and danger of an operation, frequently long and severe, and always more or less mutilating. These observations seemed to me proper, as a caution that might usefully accompany this edition, in which a newish operation, attended with all its usual attractions, good and bad, is submitted to the notice of the profession. At the same time, I particularly request the reader to observe, that, in the chapter on this subject, the kinds of disease, for which the operation was deemed indispensably necessary, by surgeons of great eminence and judgment, are faithfully described.

The critics have sometimes complained of the increased charge commonly attending new editions: it gives me much pleasure, therefore, to have been able to reduce the size and expence of this work, as I hope, without having diminished its usefulness.

May 17. 1826.

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THE

FIRST LINES
OF THE
PRACTICE OF SURGERY.

CHAP. I.

INFLAMMATION.

In almost all the cases which fall under the care of surgeons, inflammation is more or less concerned, either as a cause, a symptom, a complication, or even as a means, or mode of cure. It may occur in any texture where blood-vessels are situated, and consequently nearly all parts of the body are liable to it. The symptoms, commonly indicating its presence, consist of pain, swelling, heat, and redness in the parts affected; but each of these effects does not prevail equally in every form of inflammation, and sometimes one or more of them may be nearly, or quite absent. Thus, in erythema, the redness is attended with little or no swelling; while, in particular states of chronic inflammation, a great deal of swelling may be accompanied with little or no redness, and with no sensation amounting to pain. Inflammation, then, is a process, liable to considerable variety, which is often regulated by the nature of its exciting cause, and frequently by that of the constitution, or the situation and structure in which it takes place. The differences, noticed in the character of inflammation, have led to the division of it into several kinds, as *acute* and *chronic*; *healthy* and *unhealthy*; *simple* and *complicated*. By *acute* is implied, that which produces all its effects quickly: its varieties are numerous, comprehending not only every instance of healthy, simple inflammation, but many other cases, justly regarded either as unhealthy or complicated. *Chronic* inflammation, on the other hand, signifies that which is slow in its progress; frequently beginning almost imperceptibly; but sometimes coming on as the consequence of acute inflammation. It is to the changes produced by it, that the moderns impute almost all the slow thickenings of various textures, and the formation of the generality of indolent tumours. Many of its effects are exemplified in the ravages of scrofula, while the decline of acute inflammation into it is seen in every case of ophthalmy and gonorrhœa. By *healthy* inflammation, is meant that which is not characterized and modified by any particular disease in the part or constitution; while the term *unhealthy* is applied to cases, in which the appearances, progress, and termination of the inflammation, are under the influence of some determinate disease in the parts affected, or the system at large. By *simple* inflammation, surgeons understand, not only that it is of a healthy kind itself, but unconnected with any specific disease, like syphilis, fungus hæmatodes, cancer, &c., all which affections are frequently surrounded by inflammation, not of their own peculiar nature, yet deserving the appellation of *complicated.* Inflammation may also be said to be complicated, when attended with the lodgment of bullets, dead portions of bone, or other foreign bodies, which cannot be immediately removed.

Amongst the most remarkable effects of inflammation, is the permanent adhesion of parts to each other. The process by which such an union is formed, is certainly one of the most interesting operations of which the animal economy is capable; for it is by means of it that wounds, fractures, and other serious injuries of the body are repaired, while numerous diseases not only receive a boundary from it, but are cured in a great measure by the changes to which it gives rise. Another frequent and important effect of inflammation is suppuration, or the production of the fluid named pus; a third, is ulceration; and the last to which I shall now advert, gangrene, or mortification. Hence, another common division of inflammation into the *adhesive; suppurative; ulcerative;* and *gangrenous.* Frequently, an original disposition to one of these consequences prevails: thus, in boils and whitlows, there is always a tendency to suppurate, and in carbuncles, to slough. Certain kinds of inflammation, however, rarely or never end either in suppuration, ulceration, or mortification; but, however violent, ultimately subside without producing any of these effects, as is exemplified in gout, and the inflammation called mumps. The course, indeed, which some inflammations follow, is so fixed, that it is very difficult, and generally impossible to alter it: thus, the gradual subsidence of the swelling, known by the name of mumps, without any sore or abscess, is as constant as the suppuration of a whitlow.* Also, whether inflammation is to be the adhesive, suppurative, ulcerative, or gangrenous, often depends upon the particular situation and structure of the parts affected. In the cellular membrane, the body in general, its circumscribed cavities, deeply seated organs, and serous membranes, the adhesive inflammation is most disposed to happen †;

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* See J. H. James on Inflammation, p. 16. 8vo. Lond. 1821.

† The cellular membrane is also liable to a species of inflammation, in which one remarkable feature is the little tendency to the effusion of coagulating lymph, so that the disorder is not circumscribed, but spreads under the integuments to a vast extent, attended with typhoid symptoms, and followed by suppuration. It is well described by Dr. Duncan, in the Med. Chir. Trans. of Edinb.; and by Dr.

while nearness to the surface of the body, and the texture of a mucous membrane, are circumstances facilitating the occurrence of suppuration.* In parts of inferior vascularity, like tendons, fasciæ, &c. inflammation readily occasions mortification.

Healthy inflammation, especially when situated near the surface of the body, is often named *phlegmon*, the symptoms of which are a throbbing pain, a firm, circumscribed swelling, an increased heat and more or less redness of the parts affected. The redness does not terminate in an abrupt edge, like that of many other kinds of inflammation, but fades away imperceptibly in the surrounding skin. These local symptoms, when the disorder is severe, either on account of its degree, extent, or the nature of the parts affected, are constantly accompanied with a febrile disturbance of the whole system, named accordingly the *sympathetic* or *symptomatic inflammatory fever*.

There is reason to believe, that acute inflammation extends its effects to the whole of the circulating blood; for, when a portion of this fluid is discharged by bleeding, and afterwards examined in the basin, the appearances following its coagulation, are very different from those remarked in ordinary blood. The coagulation takes place more slowly, and generally more firmly than usual; and, when it is finished, a stratum of fibrine, which is generally of a yellowish buff colour, or rather like glue, and of greater or lesser thickness, is left upon the surface of the crassamentum, which itself often floats in an extraordinary quantity of serum. The stratum of fibrine, or of fibrine blended with coagulated albumen, here described, is well known by the name of the *inflammatory crust*, or *buffy coat;* and blood, presenting the above mentioned phenomena, is called *sizy*, in consequence of its being supposed to contain a preternatural quantity of fibrine, or glutinous matter. I know of no subject to which an intelligent experimenter could more usefully direct his researches, than that of the buffy coat of the blood, particularly with the view of ascertaining the circumstances influencing its formation. The surface of sizy blood is generally described as hollow, or *cupped*, as the phrase is; but whether it assumes this shape or not always depends upon the particular state of the buffy coat itself. This is so much the case, that when the crust is thin and soft, the crassamentum adheres a good while to the sides of the basin, and the surface of the blood, instead of becoming concave, with its edges drawn inwards, or towards the centre, as the serum separates, is really flat, or even slightly convex. It is only when the buffy coat is thick and compact, when the coagulated mass soon separates from the sides of the basin, and floats in a large quantity of serum, that sizy blood presents a concave appearance.

Scot, in the Edinb. Med. and Surg. Journ. No. 75. They name it *diffuse inflammation of the cellular membrane.* Authors mostly represent it as inflammation of fasciæ, or as a consequence of some kinds of erysipelas.

[*] Consult J. Hunter on the Blood, &c. 4to. Lond. 1794.

Another fact, made out in modern times, is, that when the buffy coat is thick and compact, the firmness of the coagulum, and its proportion of fibrine, are accordingly lessened; a circumstance, well deserving of attention, as it is a proof of the great tendency which there is in fibrine during the existence of inflammation, to separate from the other constituent parts of the blood. Sometimes minute bubbles of air are seen under the buffy coat, resembling, in a particular light, small particles of oil; but the causes of this peculiarity are not understood.

The buffy coat is disposed to occur in the generality of inflammatory complaints, and occasionally in continued fever, intermittents, the scurvy, certain nervous affections, and most cases productive of febrile disturbance. De Haen noticed it on the blood of healthy persons, who had been bled in the spring as a matter of custom. Pregnant women, individuals who work hard in frosty weather, and soldiers, keeping watch at night in the cold season of the year, usually have sizy blood. The late Dr. Parry also met with persons whose blood was in this state, though no vestige of local inflammation could be discovered about them, and their pulse did not exceed sixty. On the other hand, cases are related, where inflammation prevailed in a severe degree, yet the blood discharged by venesection was quite free from the buffy coat.* Sometimes, in the same bleeding, the blood is buffy in one basin, but not in another.† The causes of these, and several other anomalies respecting sizy blood, make a subject yet requiring investigation, and, in truth, nothing whatever is known about the immediate cause of the buffy coat itself. The slow coagulation of the blood in inflammation, and the consequent gravitation of the red globules ‡; the size of the stream in which it issues from the vein; the shape and temperature of the basin or cup in which it is received; its exposure to, or exclusion from the air; are various circumstances, the effects of which have been attentively considered; but, hitherto, without throwing any material light on the present subject. The particulars, however, here explained, should lead us not to adopt, without some limitation, the doctrine that the buffy coat is a sure criterion of inflammation, and always a sufficient reason for bleeding. Considered with the state of the pulse, the situation and nature of the pain experienced, and other symptoms, it certainly forms a valuable guide in practice; and there are even some cases of internal inflammation, especially those in which the bowels are effected, where, on account of the small pulse, and general appearance of weakness, the practitioner would often be afraid to bleed, were it not for the instruction derived from the sizy quality of the first two or three ounces of blood drawn for the sake of experiment.

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* C. Heineker, Lond. Med. Repos. Feb. 1820.

† Dict. des Sciences Med. tom. 7. p. 182.

Hunter, Op. cit. pp. 513—515.

Several of the symptoms of inflammation may be obscured, or essentially altered, in consequence of the particular situation, structure, and nature of the parts affected. The different effects, also, resulting from the disturbance of the functions of various organs, must obviously produce a material diversity in the symptoms. Thus, when the viscera, or other deeply seated parts are inflamed, of course the swelling, redness, and throbbing are not manifest to the eye or touch. But, though the diagnosis may receive no elucidation from these symptoms, the nature of the disorder still betrays itself by the inflammatory fever; the situation of the pain; the particular functions impeded, or disturbed; and the sizy appearance of the blood.

The redness of inflamed parts arises from the dilatation of small vessels, veins * as well as arteries, which become large enough to admit the red globules in abundance. This change being completely visible, is one that must be received as an undoubted truth, whatever may be the theory established respecting the state of other minute, secerning, or capillary arteries, which are sometimes inferred to be, not in a dilated, but a constricted state. Mr. Hunter had an idea, that the redness sometimes partly depended upon the generation of new vessels. In ordinary cases, however, none of the redness can be ascribed to it; for, a part may be reddened in a few seconds by friction, the application of heat, &c., in which circumstance, there cannot be time for the formation of additional vessels. The fact, also, of many parts, which are naturally colourless, being rendered quite red by anatomical injection, tends to prove that the distention of such vessels as already exist may account for a great increase of redness. Yet we are duly to remember the curious circumstance of blood-vessels becoming visible during inflammation in organs, which can never be made to indicate any vascularity, as far as can be learned from the use of fine anatomical injections; a fact, which induces Meckel † to adopt the Hunterian doctrine, that new vessels are sometimes actually produced in inflammation, particularly when it affects parts of inferior vascularity, like the cornea.

Perhaps, however, his view of this question does not gain much support from the circumstance of inflamed parts exhibiting a vascularity, which could not be demonstrated in their healthy state. On the contrary, I believe, that inflammation can never happen, except where vessels are situated. All the phenomena of this process are a proof of their presence. That it enlarges them, and renders them capable of receiving red blood, is perfectly certain; and it is on this principle, that we can account for their becoming visible, when no injection would perviate them in their ordinary state. In short, no sound physiologist will argue, that parts are

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* Hunter on the Blood, &c. p. 282. Thomson's Lectures on Inflammation, p. 87. Op. cit. p. 285.

† See Meckel's Handbuch der Pathologischen Anatomie 2ter. b. 2ter. abth. p. 23. Leipzig. 1818.

not vascular, because the vessels cannot be discerned; and he judges of the question more accurately, by considering what mutations each structure exhibits in health and disease. Whatever doubts, however, may attend this subject, with respect to the more familiar examples of inflammation, it is universally allowed, that new vessels are frequently developed in the coagulating lymph, on the surfaces of inflamed serous membranes, in fresh wounds, in many instances of chronic inflammation, and in new growths.

In cases of ophthalmy, the surgeon has an excellent opportunity of observing the dilatation of the vessels, and the consequent appearance of redness: enlarged vessels, which naturally held only a colourless fluid, not only present themselves in myriads upon the conjunctiva, but extend their branches over the cornea itself. The enlargement of the smaller vessels, and the increase in the number of those, which become capable of containing red blood, are facts which can be seen with the naked eye; and they may be rendered still more obvious by means of the microscope, and the art of injecting. Hunter froze the ear of a rabbit, and thawed it again. A considerable inflammation, and an increased heat, and thickening of the part ensued. While the ear was violently inflamed the animal was killed; its head injected; and its ears removed and dried. The uninflamed ear, when dried, was clear, and transparent, and its vessels could be plainly seen ramifying through its substance; but, the inflamed ear, when dried, was thicker and more opaque, its arteries being considerably enlarged.*

The swelling and tension of inflamed parts proceed from the dilatation of the vessels; their turgid state; the extravasation of serum and coagulating lymph; and the interruption of absorption.† That the extravasation of coagulating lymph has a remarkable share in producing the swelling of inflamed parts is unquestionable; for it fills up all their interstices, glues their whole structure together, and consolidates them into one mass. Frequently, when its quantity is considerable, it is converted into a true cellular, or membranous texture, or assumes, more or less, the peculiar qualities of different organs. This is very evident in the bones. By means of such change, also, several loose parts may acquire the external properties of denser organs. Thus, the lungs are sometimes turned into a liver-like substance, a morbid alteration long since described by Morgagni, under the name of "hepatisation."‡

According to Hunter's experiments, the temperature of an inflamed part, as indicated by the thermometer, is much lower than what the feelings of the patient would lead one to suppose; and he was inclined to think, that it never exceeds that of the blood in the heart. By artificial means, he excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to detect any considerable rise in the temperature of those parts. In a patient, however, upon whom he had operated for hydrocele, the rise was much more remarkable; for, a thermometer, introduced into the tunica vaginalis immediately after the operation, indicated a temperature of only ninety-two degrees; but, on being again introduced the following day, the quicksilver rose to ninety-eight and three quarters. Yet, even in this case, it was supposed, that the temperature of the inflamed parts was less than that of the blood near the heart.*

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* Hunter on the Blood, &c. p. 280.

† See Soemmering De Morbis Vasorum Absorbentium, 8vo. 1795.

‡ De Sedibus et Causis Morb. Epist. An. Med. XXI. 2. 13. 17. 19. 27. Meckel, Handbuch der Pathologischen Anatomie, b. 2. abth. 2. p. 26.

It is more easy to conceive than describe how any quick deviation from the natural state of parts must excite pain. In chronic inflammation, the graduality of the change allows the nerves to become adapted to it, and the degree of pain only amounts to a dull uneasiness: but, in phlegmon, the change being quick, the pain is considerable. Each kind of inflammation seems to have its particular sort of pain. Thus, phlegmon excites a pain, which is joined with a sense of throbbing and heaviness; erysipelas gives rise to a pungent itching kind of pain; and anthrax causes a pain, characterized by a sensation of burning and stiffness. Some organs, which naturally possess little sensibility, are remarked to become exquisitely painful, when inflamed; a curious fact, of which there are continual proofs in the practice of surgery.

The throbbing is sometimes described as depending upon the strong pulsation of the arteries, which are alleged to beat in many instances with preternatural force, not merely in the seat of the inflammation, but for some way from it towards the heart. "Inflammation," says Mr. Hunter, "is not only an action of the smaller vessels in the part itself, but in the larger vessels leading to it. This is proved in whitlows, where the inflammation and throbbing pain are confined to the extremity of the finger; yet, when we grasp the finger, a strong pulsation is felt in the two arteries leading to the inflamed part, while no such pulsation can be felt in the other fingers. If the inflammation be very considerable, the artery, as high as the wrist, will be sensibly affected."† The preceding fact, though not advanced by Hunter for any such purpose, is always strongly insisted upon by certain authors and lecturers, who inculcate the doctrine of the arteries contracting with increased force in inflammation, as a complete proof of their hypothesis. But this mode of accounting for the throbbing is not universally admitted; and Hunter himself was far from drawing any such conclusion; for all that he presumes to say, is, that the increased throbbing, felt in the inflamed part, and for some way from it, proves that the arterial system is *dilating* itself, and allowing more blood to pass than usual.

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* Hunter on the Blood, &c. p. 293.

† Op. cit. p. 278.

The very first act of the vessels, when the stimulus which excites inflammation is applied, is exactly similar to a blush; simply, an increase or distention beyond their natural size. Afterwards a new action begins, which is probably the separation of the coagulating lymph, and the throwing of it out of the vessels*, together with a proportion of serum, which is the cause of the soft, doughy, œdematous tumor often seen about an inflamed part.

Inflamed serous membranes very readily effuse coagulating lymph, which also becomes vascular and organized, with great rapidity, so as to complete the stages of adhesive inflammation. In this way are produced those unchangeable adhesions, which are so commonly found between the lungs and pleura costalis; and between the intestines and peritoneum. A similar effusion may take from inflamed mucous membranes, especially those of the alimentary canal, larynx, and trachea, the products of the effused lymph, assuming the form of hollow or solid cylinders, corresponding to these canals in shape†; but this only happens when mucous membranes are the seat of violent, or peculiar inflammation, and, under other circumstances, they more readily effuse pus, than coagulating lymph. Also, when coagulating lymph is effused upon the surface of a recent wound, or the ends of a broken bone, it changes into a vascular mass, which ultimately forms a permanent bond of union between the parts.

New vessels are sometimes developed in coagulating lymph with surprising quickness. One morning, at seven o'clock, Sir E. Home‡ operated upon a man, who had a strangulated femoral hernia. The hernial sac was opened, and found to contain a portion of bowel six inches in length, which, on careful examination, seemed quite smooth, and without any extraordinary appearance of vascularity. Nine-and-twenty hours after the operation the patient died, having had scarcely any pulse during the last five hours of his existence. On dissection, the strangulated part of the bowel was found highly inflamed, its external surface soft, and covered in several places with coagulating lymph. A fine injection penetrated all these distinct portions of lymph, demonstrating in each a considerable artery, accompanied with a large vein. The coagulating lymph then had been manifestly effused after the operation; and, as from the almost lifeless state of the patient during his last five hours, we cannot suppose that any new vessels could be formed during that period, it follows, that they can be produced in a space of time less than twenty-four hours. The case also proves that such vessels inosculate with the old, or original ones.

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* Hunter, p. 279.

† Meckel, Op. cit. b. 2. abth. 2. p. 50. See also the appearances in Croup, as delineated in Baillie's plates of Morbid Anatomy.

‡ On the Properties of Pus, p. 41.

According to Meckel[*], the new vessels are only extensions or continuations of the old ones. Soemmering[†] relates several cases in which it was demonstrated by injections, that the vessels, produced in membranous adhesions of the chest, did not proceed from the lungs to the pleura, but originated from this last membrane in the situation of every intercostal artery. The thing is represented in the same way by Monro.[‡] A large membranous adhesion, which connected the intestine and peritoneum together, derived its vessels also from those of the latter membrane.

In the centre of the extravasated substance, which connected inflamed parts, and on the surfaces after separation, Hunter frequently noticed small specks of red blood: these could hardly have been extravasated with the coagulating lymph; for they would then have been more diffused, plainly connected with the vessels, and not situated within the lymph. A corresponding extravasation would also have resulted from injections, which was not the case. Hence Mr. Hunter was led to conclude, that the blood was produced in the new-formed coagulum itself, exactly as in the incubated egg, blood is formed at distinct unconnected points; and Meckel thinks the account is rendered more probable by the fact of the formation of blood and vessels in this new structure, going precisely through the same stages as the incubated egg; inasmuch as at first merely tubes for the blood can be discerned, but nothing like regular vessels.[§] However, if a statement made by Sir A. Cooper in his lectures be correct, Mr. Hunter renounced this doctrine previously to his death; and adopted the opinion, that the new vessels always shoot from the old ones into the coagulating lymph. This is also the view which Sir Astley himself entertains.

Whatever may be the situation of inflammation, it is always most violent on the side nearest to the external surface of the body; a curious fact, first pointed out by Mr. Hunter, and so constant, that it may be regarded as a sort of law in the animal economy, the usefulness of which in creating a tendency in many diseases not to spread deeply must be sufficiently manifest.

The causes of inflammation are divided into the *remote* and *proximate*. The epithet *remote* is badly chosen; for it comprehends many things which contribute immediately, as well as remotely, to the production of inflammation. In most instances, we are able to trace the origin of this process to causes, which act either directly upon the part affected, or indirectly upon it through the medium of those inexplicable sympathies, which connect distant parts of the body with one another. As illustrations of the latter remark, Professor Thomson, of Edinburgh, adverts to the effects of particular kinds of food, and of small doses of mercury, or arsenic, which, after being taken into the stomach, sometimes produce distinct and specific inflammations of the cutaneous texture. The exposure of the feet to cold, he also observes, occasions in one person an inflammation of the throat; in another, an inflammation of the chest; and, in a third, an inflammation of the belly.[*] The expression, *exciting* causes, which is sometimes employed, is more correct than the term *remote.* These remote or exciting causes of inflammation are very numerous; but, as they mostly admit of being referred to external violence or irritation, from mechanical or chemical means, a full detail of them would be superfluous. Suffice it to say, then, that wounds, fractures, contusions; the lodgment of a thorn, bit of glass, or other extraneous bodies in the flesh; a scald, or burn; exposure to cold; and the application of innumerable irritating substances to parts; are common exciting causes of inflammation. Fevers often appear to have a similar effect. Sometimes inflammation arises spontaneously, or (to speak more correctly) no perceptible cause can be assigned for it.

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[*] Handbuch der Pathol. Anat. b. 2. abth. 2. p. 52.

[†] Transl. of Baillie's Morb. Anat. p. 52, note 67.

[‡] Obs. on the Nervous System, pl. 15.

[§] B. 2. abth. 2. p. 35.

By the term *proximate* cause, pathologists generally imply that state of the part affected, upon which the phenomena peculiar to inflammation immediately and primarily depend. They mean, in fact, that secret process, that first essential action in the part, which constitutes the very beginning of inflammation, keeps up its progress, and is inseparably connected with its existence.

While Galen and Boerhaave ascribe the proximate cause of inflammation to particular states of the blood and humours, Stahl, Gorter, Hunter, and Cullen, all concur in imputing it rather to an affection of the vessels. If the state of the whole mass of the blood were the cause, why should inflammation be confined to any particular part? It is a general opinion, that a larger quantity of blood is determined to an inflamed part than in the natural state.[†] If an incision be made into it, the blood gushes out more profusely than from a cut in a similar part free from inflammation. Now, although this does not completely prove that there was actually an accelerated flow of blood through the inflamed part previously to the incision, it is a phenomenon which cannot arise from any peculiarity in the action of the heart; an organ, which drives the blood equally into the whole arterial system. The fact must be referred either to the augmented diameter of the vessels of the part affected, or to the peculiar property of the arteries, which, in the healthy state, at least, are not simple mechanical tubes for the transmission of the blood, but active instruments in the promotion of the circulation, possessing, besides their elasticity, a vital power of action, arising from their muscular structure.

We have mentioned the dilatation of the small vessels, as one of the earliest perceptible changes in the process of inflammation. Several lecturers, I observe, do not describe the dilated state of the small arteries of an inflamed part as regular and permanent, but as joined with alternate, proportionately increased contractions. No doubt, this notion of the nature of the increased action in inflammation is derived, partly from the throbbing in phlegmonous swellings, and partly from the recollection of the natural systole and diastole of the arteries in the healthy state; but its correctness has not yet been proved either by experiment or observation. * Professor Thomson and Dr. Parry could see no such motions in the small arteries, which were miscroscopically examined in their expements relative to inflammation, and Mr. Hunter is so far from countenancing this supposition, that he gives a decided opinion, "that in inflammations the muscular coats of the arteries do not contract." † When, therefore, he describes inflammation as an increased action of the vessels, he does not imply that such action consists in increased dilatations and contractions, alternately performed. The dilatation of the vessels of an inflamed part is a subject on which he displays a great deal of ingenious reasoning. The muscular power of the arteries seems to him to give way in inflammation, because they are more dilated than their natural elasticity would allow, which must also be increased. He conceives that this change is something more than simply a common relaxation; "we must," he says, "suppose it an action in the parts to produce an increase of size for particular purposes," and this he would call the "action of dilatation." He compares it with the increase of the size of the uterus in pregnancy, with the enlargement of the os tincæ in the time of labour; the consequence of the preceding actions, and necessary for the completion of those which are to follow. ‡

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[*] Lectures on Inflammation, p. 50, 51.

[†] Mr. Hunter every where expresses his belief, that the blood circulates in greater quantity, and with increased velocity, through inflamed parts.

That the proximate cause of inflammation cannot be satisfactorily explained, upon any principle hitherto suggested, must be acknowledged; for, there must be something besides merely an increased action of the vessels; there must be something besides an enlargement of their diameters to constitute inflammation. Both these changes happen to the external carotids in the growth of the stag's horns; to the spermatic arteries of animals, which copulate only at certain seasons of the year; and to the arteries of the uterus in pregnancy. Such changes probably always happen, whenever there is any process going on in the animal economy requiring an extraordinary supply of blood §: still, in the instances now mentioned, there is no inflammation, no pain, no symptomatic fever. A simple inequality in the distribution of the blood, therefore, uncombined with other causes, cannot account for the origin of this process.

A very opposite theory to that which prevails in the schools of medicine in this country, was entertained by Vacca ||, Mr. Allen, of Edinburgh, &c. They supposed the action of the vessels of every

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* Thomson's Lectures on Inflammation, p. 75.

† On the Blood, &c. p. 285.

‡ Op. cit. p. 282.

§ Hunter, p. 288.

|| Liber de inflammationis morbosæ, quæ in humano corpore fit, natura, causis, effectibus, et curatione. Flor. 1765.

inflamed part to be diminished; and that there actually existed in it a congestion of blood, proved by the increase of bulk and redness of the small arteries, and by the increased flow of blood, when an inflamed part was divided.

The sense of throbbing, Allen, Callisen, &c. attribute to the difficulty which the blood meets with in passing from the arterial trunk into the capillary branches[*]; and the former considers it as no criterion of the force with which the artery contracts, since it is produced during the diastole of the vessel, and by a power foreign to it.

Attempts have been made to support the doctrine of the diminished action of the inflamed vessels by an appeal to experiment, and Dr. Philip and Mr. Boraston, undertook some investigations, from which it was concluded, that, in the arteries of inflamed parts, the circulation is slower, than in those of uninflamed parts.[†] Professor Thomson also instituted experiments, for the purpose of settling this disputed point, and he infers, that inflammation is sometimes attended with an accelerated, and sometimes with a retarded circulation through the capillary vessels of the inflamed part; consequently, that neither of these changes ought to be included in a definition of the process.[‡]

Whatever may be the real state of the capillary vessels in a part affected with acute inflammation, I believe that none of the experiments, hitherto made in relation to this point, have cast any doubt on the truth of the generally received doctrine, that there is an increased determination of blood to the part itself. Such augmented flow of blood to a limited point of the animal machine, cannot be produced by the action of the heart, but must arise, independently of it, from a power possessed by the vessels themselves; the same kind of power which occasions an increased determination of blood to the cheeks when a person blushes, and which injects the corpora cavernosa under venereal excitement. Unless it be admitted, that there is an accelerated flow of blood at least to an inflamed part, if not completely through all its minute arteries and veins, it is difficult to account either for the rise in its temperature, or the efficacy of measures calculated to lessen the force of the circulation.[§]

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[*] Arteriæ minores pressione sanguinis irruentis calidioris dilatatæ atque elongatæ, in ductos serpentarios flecti, et sanguinem prementem ægre promovere videntur, non in ipsa parte adfecta solum, sed in vasis circumjectis quoque; inde pulsatio in parte inflammata. (Callisen. t. i. p. 191.)

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[‡] Lectures on Inflammation, p. 75, &c.

[§] See Quarterly Journal of Medical Sciences for Oct. 1825, p. 650.

TREATMENT OF PHLEGMONOUS INFLAMMATION.

The first object in the treatment naturally consists in removing the causes of the disorder. If the irritation of a splinter were to give rise to phlegmonous inflammation, who would not of his own accord extract the offending substance? But the removal of the stimulus producing inflammation will not always put an immediate stop to it; for the living parts have been injured, and this process is necessary for their reparation. In this point of view, it can only be regarded as hurtful, when its violence and intensity are likely to prevent the accomplishment of the salutary ends for which it generally commences.

In whatever manner the several differences, respecting the nature of inflammation may be hereafter reconciled, it will always be a primary indication to diminish, by means of bleeding, or other expedients, the quantity and impetus of the blood flowing towards the inflamed part. The utility of this maxim is so confirmed by experience, that, whatever may be the theory espoused concerning the state of the capillary vessels in an inflamed part, no difference of opinion prevails with respect to the rule of practice. Indeed, at the present day, surgical ingenuity is constantly active, in devising plans for carrying this principle into execution with the greatest effect; and even the bold measure of tying large arteries, for the relief of inflammation, has been both recommended and tried. Such treatment, though unnecessary in ordinary cases, may not be decidedly improper in others of a more urgent nature; like the dangerous kind of inflammation resulting from wounds of the knee, and bad compound fractures and dislocations. †

General bleeding, by which we are to understand the extraction of blood from a largish vessel at a distance from the inflamed part, is sometimes less advisable than *topical bleeding*, or the taking away of blood from the inflamed part itself, or its vicinity, by means of leeches, cupping, &c. The nearer the bleeding is to the seat of inflammation, the more efficacious it is, and the less the occasion for taking away such a quantity as might be followed by an unnecessary degree of weakness. In all cases of urgency and importance, however, general bleeding is indispensable; and, in many instances, the surgeon is obliged to employ venesection, or arteriotomy, not merely once, but repeatedly, in conjunction with leeches and cupping. The necessity of such practice is often exemplified in wounds of the head, chest, and abdomen; and in cases of inflammation within either of those cavities; or affecting any of the large joints; or so delicate an organ as the eye.

The efficacy of bleeding is greater, the sooner it is practised, and the more suddenly the blood is evacuated. Hence the utility of sometimes making the opening in the vein large, especially in cases, where the patient's safety absolutely depends upon an immediate stop being put to the inflammation. The fainting, frequently produced in this manner, causes an immediate, but temporary, suspension of every operation in the system, and, amongst others, of the process of inflammation.

Topical bleeding can only be powerfully efficacious, when general plethora has been previously removed; but if no plethora, and not much fever exist, it may have immense effect; and, as Dr. Thomson truly remarks, whenever any doubt arises, with regard to the propriety of venesection, it may be laid down, as a common rule, that it is safer to employ local, than general bleeding.*

Whenever general bleeding is requisite, the quantity of blood to be taken away should be determined by the united considerations of the organ affected, the severity and urgency of the symptoms, the strength and age of the patient, the state of the pulse, and the appearance of the blood itself, in relation to the buffy coat. In injuries of the brain and lungs, the patient's sole chance of recovery often depends upon the boldest use of the lancet; and, in the records of surgery, many instances are to be found, in which life seems to have been saved by the sacrifice of two or three hundred ounces of blood in the short space of a few days.

Mild saline purgatives not only diminish the quantity of circulating blood, by the increased secretion which they occasion in the alimentary canal, they operate specifically, in lowering all the operations of the system, and must, therefore, tend to subdue inflammation. As they have not so debilitating an effect as bleeding, they are seldom omitted, even when this is considered unnecessary. The most eligible are the sulphates of soda and magnesia; and the tartrate of potass, alone, or joined with the infusion of senna. For cases requiring the bowels to be opened without the least irritation, the oleum ricini deserves to be particularly recommended. As drastic purgatives mostly produce irritation, they are not prescribed in ordinary cases of inflammation. But the submuriate of mercury is not unfrequently employed, particularly in children, and in other subjects, whose chylopoietic organs are disordered. When necessary, the operation of purgatives is to be assisted with clysters.

Nauseating doses of tartarised antimony prove advantageous in several ways; they relieve that oppressive dryness of the skin which accompanies the fever attendant on severe local inflammation; they diminish the increased action of the heart and arteries in general; they tend to restore the secretions in general; and, lastly, they promote the removal of costiveness. Whenever nausea is produced, the whole constitution sympathizes with the stomach, and is immediately thrown into a temporary state of debility, every considerable operation in it being checked. Hence, when there is urgent reason for putting a sudden stop to inflammation, this use of antimonials ought never to be neglected, as in inflammation of the brain and its membranes, arising in consequence of external violence; inflammation of the larynx, various forms of acute ophthalmy, &c. On a similar principle, digitalis is also sometimes prescribed, though its good effects are more doubtful.

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* Lectures on Inflammation, p. 170.

The practitioners of this country, considering opium as a stimulant, seldom employ it in cases of phlegmonous inflammation, except when the pain is extremely severe. Given at an early period, in acute inflammatory diseases, it never fails to excite vascular action, and to aggravate all the symptoms of fever. Therefore, says Dr. Thomson, it is not to be used, except for the purpose of allaying the pain and irritation arising from an operation, or a recent external injury; and he thinks, that it should be generally omitted even after an operation, except when the patient is very nervous, and complains of severe pain.* The preparation of opium, called morphine, which contains the sedative virtues of the medicine, separated from its stimulating properties, is that which seems best calculated for cases of inflammation.

The patient should abstain from fermented and spirituous liquors, and animal food, confining himself to vegetable diet, gruels, slops, tea, acidulated drinks, dry toast, &c. Sweet acid fruits, and common saline draughts, have a good effect in quenching thirst, and keeping the bowels open. Above all things, quietude is to be enjoined. The patient's chamber ought to be temperately cool, and he should not be covered with too much clothing. Another object of considerable importance, is never to let an inflamed part continue in a depending position, which always retards the cure, and frequently renders the symptoms much worse, by checking the return of the blood through the veins.

Heat naturally promotes all processes taking place in the animal economy, and hence it must have a bad effect on every inflammation disposed to rise above the degree necessary for the restoration of the parts to their healthy state. It is, therefore, a common indication, to diminish the temperature of inflamed parts, by covering them with cold applications, and keeping up from their surface a continual evaporation. The lotions, most frequently employed for this purpose, consist either of one part of rectified spirit of wine mixed with five of cold water; the liquor plumbi subacetatis dilutus; or a solution of a dram of the sulphate of zinc in a quart of common water. Linen, kept constantly wet with either of these lotions, is to be applied to the part affected.

In inflamed parts, absorption seems to be more or less interrupted. Hence the great benefit resulting from discutient lotions, in all cases where the extravasation of blood, and coagulating lymph, is considerable. For the inflammation following contusions, concussions, and sprains, such applications are frequently the best which can be employed. A good lotion of this quality is the following: ℞ Ammon. muriatæ ℥ss., aceti et spirit. vini rectif. sing. ℔j. M., or one composed of the liquor ammoniæ acet. alone, or mixed with equal parts of spirits of wine, and distilled water. When the inflammation is slight, and the swelling and extravasation great, the surgeon may sometimes venture to use liniments.

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* Lectures on Inflammation, p. 72.

The fact is curious, but perfectly confirmed by experience, that inflammation is sometimes most benefited by cold applications, and sometimes by warm emollient poultices and fomentations. Although, in the early stage of the greater number of phlegmonous inflammations, cold astringent lotions are preferable to warm applications, it is occasionally otherwise, and either from singularity of the patient's constitution, or, in consequence of the structure, situation, and nature of the inflamed part, they do not produce their usual good effect. An inflamed testicle, and the incipient stage of acute ophthalmy, generally receive more benefit from emollient fomentations and poultices, than from cold astringents. Inflammations, not admitting of a cure without suppuration, should also be treated with emollients; for the sooner the matter is formed, the sooner the inflammation will end. Such is the inflammation caused by fevers, contused wounds, boils, and carbuncles.

One of the best emollient poultices is that made of linseed meal, which should be gradually mixed with hot water, until the mass is of proper consistence. A little oil is often added, which prevents the poultice from becoming dry and hard.

An eligible fomentation is thus made: ℞ lini contusi ℥j. chamœmeli ℥ij. aquæ distil. ℔vj. paulisper coque et cola. When the pain is exceedingly severe, the following one frequently produces great relief: ℞ papaveris albi exsiccati ℥iv. aquæ puræ ℔vj. coque usque remaneant ℔ ij. et cola.

The most common way, in which inflammation ends, consists in a gradual abatement of the pain, redness, swelling, throbbing, and heat of the part, without any formation of matter, or permanent injury of structure. This is termed *resolution*, and is the best manner in which inflammation can terminate.

The next most frequent termination of phlegmon is in the production of pus, termed *suppuration;* a state, however, in which there is rather a modification of the inflammation, than a cessation of it.

The other manner in which inflammation ends, is in the death of the part affected — mortification; the worst, but, happily, the least frequent, result of common inflammation.

Every part, just recovered from the violence of phlegmonous and other kinds of inflammation, may be regarded as still imperfect, and, sometimes, in consequence of the loss of tone, induced in the vessels, a languid or chronic inflammation succeeds, which cannot be overcome, without great difficulty. Hence, however improper stimulants, astringents, and corroborants may be, as local applications, during the violence of inflammation in very sensible organs, they are generally highly proper the moment that stage ceases. Thus, emollients, which, for the first day or two, are serviceable in acute ophthalmy, afterwards act prejudicially, in consequence of their relaxing nature.

CHAP. II.

OF THE SYMPATHETIC, OR SYMPTOMATIC, INFLAMMATORY FEVER.

AFTER being informed that the mass of circulating blood becomes affected in cases of inflammation, we must expect to find traces of constitutional, as well as of local disturbance. The name of the fever attendant on inflammation is derived from its being, as it were, one of the symptoms or effects of the local disorder, and the sympathy of the whole constitution with the disturbed state of a part. It is called inflammatory, because it is accompanied with an increased action of the heart and arteries, and with what is termed a *phlogistic* type. The symptoms are, a frequent, strong, and full pulse; headach; loss of appetite; nausea, and sometimes vomiting; constipation; an increase of the temperature of the whole body; a hot dry state of the skin; a dry, white, furred tongue; great thirst; universal disturbance of the nervous system; restlessness; anxiety; loss of sleep; and, in some cases, there is delirium. Perspiration is not the only secretion which is diminished: all the other secretions are similarly affected. For instance, the flow of saliva into the mouth is diminished, and ulcers and other surfaces secreting pus are dried up upon an attack of fever. The urine is not only diminished in quantity, its chemical properties appear to undergo considerable alterations. Though of a high colour, it deposits upon standing no lateritious sediment, or uric acid, as it almost constantly does the moment the fever begins to abate. * The impediment to the various secretions in the alimentary canal may also account for the constipation.

Such is the general nature of the febrile symptoms, when any considerable degree of phlegmonous inflammation affects common parts, like the integuments; the disturbance of the system being in a great measure proportioned to the extent and violence of the local affection.

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* See Thomson's Lectures, p. 115.

inflamed part to be diminished; and that there actually existed in it a congestion of blood, proved by the increase of bulk and redness of the small arteries, and by the increased flow of blood, when an inflamed part was divided.

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Attempts have been made to support the doctrine of the diminished action of the inflamed vessels by an appeal to experiment, and Dr. Philip and Mr. Boraston, undertook some investigations, from which it was concluded, that, in the arteries of inflamed parts, the circulation is slower, than in those of uninflamed parts. [†] Professor Thomson also instituted experiments, for the purpose of settling this disputed point, and he infers, that inflammation is sometimes attended with an accelerated, and sometimes with a retarded circulation through the capillary vessels of the inflamed part; consequently, that neither of these changes ought to be included in a definition of the process.[‡]

Whatever may be the real state of the capillary vessels in a part affected with acute inflammation, I believe that none of the experiments, hitherto made in relation to this point, have cast any doubt on the truth of the generally received doctrine, that there is an increased determination of blood to the part itself. Such augmented flow of blood to a limited point of the animal machine, cannot be produced by the action of the heart, but must arise, independently of it, from a power possessed by the vessels themselves; the same kind of power which occasions an increased determination of blood to the cheeks when a person blushes, and which injects the corpora cavernosa under venereal excitement. Unless it be admitted, that there is an accelerated flow of blood at least to an inflamed part, if not completely through all its minute arteries and veins, it is difficult to account either for the rise in its temperature, or the efficacy of measures calculated to lessen the force of the circulation. [§]

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CHAP. III.

SUPPURATION.

SUPPURATION is that process, by which pus, or the matter of sores and abscesses is formed; and the word *abscess* signifies nothing more than a collection of purulent matter. Like inflammation, suppuration may be either *acute*, or *chronic*; *simple*, or *complicated* with some specific morbid action, the lodgment of extraneous substances, &c. Thus, we see acute suppurations exemplified in common whitlows; in milk-abscesses; and many gunshot wounds, and compound fractures; while chronic suppurations are illustrated in that frequent and serious form of disease, the lumbar abscess, and in several of the effects of scrophula. Abscesses of the scrophulous kind afford us also striking instances of what may be called chronic suppurations, complicated with specific morbid action, just as true venereal buboes present us with specimens of acute abscesses, complicated also with specific disease. At present, my observations will be confined to the simple, acute form of suppuration, arising from phlegmonous inflammation.

When, notwithstanding the foregoing treatment, the inflammation is attended with more severe pain, a distressing pulsatory sensation, a much harder tumefaction, and a conical, but softer prominence in its centre, suppuration is likely to ensue. Sometimes this event may from the first be prognosticated; because there are inflammations, which, from their peculiar nature, necessarily terminate in suppuration: as boils and carbuncles, and the inflammation, induced by fevers, occasionally termed *critical*.

When the patient is seized with reiterated shiverings; when the fever, and all the symptoms of inflammation suddenly diminish, without any perceptible reason; when the patient experiences a heavy, cold, dull uneasiness, instead of acute pain, in the part affected; when the most elevated point of the tumor appears soft and white, while the rest has its redness increased; and when, at the same time, the surgeon can feel a fluctuation, matter is undoubtedly already formed.

The latter symptoms only occur, when the matter is superficially situated. In other cases, the quick subsidence of all the inflammatory symptoms, the repeated rigors, and the sense of weight and coldness, only afford grounds for suspecting that matter is formed. This suspicion, however, is afterwards strengthened by the patient having nocturnal sweats, with emaciation and other hectic symptoms. Also, an œdematous swelling, which is at first not very extensive, takes place over the situation of the abscess, and afterwards spreads, so as sometimes to extend over a whole limb. These circumstances leave no doubt of there being a deeply-seated collection of matter. A man, endued with great nicety of touch, can often feel the undulation of matter, even when deeply lodged.

The exposure of the internal surfaces and structure of the body, continued for a certain time, necessarily occasions suppuration. Here the influence of the air is not the cause; for, were a wound made into a cavity naturally closed, pus would be formed, after a certain time, even in a vacuum. When matter forms in circumscribed cavities without a wound, the air cannot be suspected as a cause: nor does the air, in emphysematous cases, excite suppuration.

The sympathetic fever, attendant on inflammation, has been considered an essential step to suppuration; but with little foundation. Is there not a regular secretion of pus from the most indolent ulcers? Is there not the same process on every blistered surface? In such cases, is there not often a total absence of fever?

That dead animal matter cannot be converted into pus, is proved by sloughs of the cellular membrane, tendons, fasciæ, &c. &c. remaining unchanged in abscesses a considerable time, and by dead bone lying unaltered in pus for many months. Whatever diminution of these substances may happen under such circumstances, occurs only on that side which is next to the living solids, and it can be satisfactorily accounted for on the principle of absorption.

The idea, that fermentation contributes to the formation of pus, is quite destitute of foundation. The discharge of pus from secreting surfaces, without any loss of substance; the stationary state of many abscesses; the backwardness of matter to become putrid, while unexposed to the air; sufficiently evince, that no fermenting power is present.

The opinion, that extravasated blood can in time be converted into pus, is equally erroneous.*

When suppuration is about to take place in the cellular substance, or membranes of circumscribed cavities, the vessels are supposed to alter their mode of action, so as to secrete pus. This change happens gradually. Hence, pus and coagulating lymph are often found blended together in the same abscess.

The fact, that pus may be formed without a breach of the solids, or dissolution of parts, seems to have attracted the notice of several eminent men about the middle of the last century, especially Dr. W. Hunter, De Haen †, Quesnay ‡, Peyronie, and Morgagni. It was in the year 1749 or 1750, that Dr. W. Hunter was first struck with this truth, in the dissection of a subject who had died of empyema; and M. Quesnay inserted in one of the early Memoirs of the French Academy of Surgery, a case which fell under the observation of Peyronie, in which a very copious suppuration of the brain took place: the patient died, and the head was examined, when the proportion of brain wanting was so trivial, compared with the quantity of pus that had been discharged, that it was justly concluded the matter had not been formed from the solids, but from the fluids, of the part. *

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* A complete and masterly refutation of all these hypotheses is contained in Hunter's Treatise on the Blood, &c. p. 417. et seq.

† Ratio Medendi, Vindob. 1750.

‡ Traité de la Suppuration, Paris, 1749.

The modern doctrine of suppuration is, that the pus is separated from the blood by the inexplicable operation of the secerning arteries, just as ordinary secretion takes place; and that the peculiar mode of action in the arteries, is the reason why pus should be separated from the circulation, rather than coagulating lymph, mucus, &c. It is further believed, that the solids never suffer any dissolution, so as to enter into the composition of pus; and that the deficiency frequently apparent in them arises from absorption. The arteries, in producing pus, a fluid so dissimilar from blood, and of which, at least, it is to be considered as a new combination, seem to assume all the power of glandular secretion.

The kind of fluid which is discharged from healing sores, or phlegmonous abscesses, receives the name of *healthy* pus; and, in this state, it has the following properties: it is of a yellowish colour; has little smell; is void of acrimony; of the consistence of cream; and when microscopically examined, exhibits white globules in a transparent fluid. At its first formation, however, no globules are perceptible, but it has the appearance of a transparent, gelatinous fluid, and it is not till about fifteen minutes after it has continued on the surface of the sore, unexposed to the air, that they are distinguishable. The globules swim in a fluid which at first might be supposed to be the serum of the blood; for, like the serum, it is coagulated by heat, though not by the gastric juice of animals. It probably contains a small quantity of coagulating lymph, since it partly coagulates after being secreted. But although the colourless fluid, in which the globules swim, is thus far similar to serum, in other respects, it is different; and, according to the observations of Mr. Hunter, it differs from every other animal secretion, in being coagulable by a solution of the muriate of ammonia. † Dr. G. Pearson found, however, that this test would not answer in the examination of matter expectorated from the lungs. He suspects also, that the globules of pus are composed of the red particles of the blood; an opinion, to which another intelligent physician appears to incline, when he says, that the magnitude of the globules of pus, as ascertained by the most accurate tests, is not sensibly different from that of the corpuscles of the blood, reduced to a round form by the addition of water, or otherwise; while the globules found in other animal fluids, for instance, in milk, are of totally different dimensions. ‡ The perfection of pus seems to depend upon the large proportion which the globules bear to its other parts. Pus sinks in water, and will not readily unite with it: at least, in the common temperature of the atmosphere, it will not mix with it, but falls to the bottom. The caustic fixed alkalies, triturated with pus, combine with it into a soapy fluid: with ammonia, it forms a gelatinous compound. In the voltaic circuit, it coagulates rapidly, and yields a substance very analogous to albumen.*

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* Mém. de l' Acad. de Chir. t. 2. p. 163. edit. in 12mo.

† Hunter on the Blood. Inflammation, p. 429.

‡ Dr. T. Young, in an Introduction to Medical Literature, p. 548. 8vo. Lond. 1813; and in a Practical and Hist. Treatise on Consumptive Diseases, deduced from original Obs. and collected from authors of all ages, p. 26. 8vo. Lond. 1815.

It has been an object with pathologists to have some certain method of discriminating pus from mucus, two secretions, which in their external appearance greatly resemble each other. According to Dr. C. Darwin, the three following characters of pus are correct: 1. Sulphuric acid dissolves it, and the solution is decomposed by water, which *precipitates* the pus. Sulphuric acid also dissolves mucus; but the addition of water separates it in flakes, which *float upon the surface*. 2. Pus is diffusible through dilute sulphuric acid, and through water and brine; but, mucus is not. 3. Caustic alkalies dissolve both pus and mucus; but, when water is added, a difference is exhibited, the pus becoming separated, but not the mucus. Mr. Brande, however, has not found the last of these criteria accurate; and, (says he,) even supposing all these statements correct, they are of no practical utility; because where pus is mixed with mucus in various proportions, the tests are not sufficiently delicate to distinguish it.

Another test of pus, recommended by Grasmeyer, is the following: triturate the substance to be examined with an equal quantity of warm water, then add to it an equal quantity of a concentrated solution of subcarbonate of potass. If pus be present, a transparent jelly subsides in a few hours, which is not the case where only mucus is present. Mr. Brande repeated these experiments, but the results were by no means satisfactory.† Besides, these chemical tests, and the general distinction of pus sinking in water, while mucus floats, an optical criterion has been proposed by Dr. T. Young, as a very simple and certain means of ascertaining the nature of matter expectorated from the lungs. He regards the globules as the essential characteristic of pus, and it is from their presence, that the test about to be described is derived, while the colour indicates, that there is no mixture of blood. If we put a small quantity of the substance to be examined between two pieces of plate-glass, and holding it near the eye, look through it at a distant candle, we shall observe the appearance even in the daytime, of a bright circular corona of colours, of which the candle is the centre; a red area, surrounded by a circle of green, and this again by another of red; the colours being so much the brighter, as the globules are more numerous, and more equable. If the substance be simply mucus, there will be no rings of colours, although sometimes there is a sufficient mixture of heterogeneous particles even in mucus, to cause the appearance of a reddish area just about the candle.*

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* Brande, in Lecture on Animal Substances. Vid. Lond. Med. Repository, vol. iv. p. 75.

† See Lond. Med. Repository, p. 76.

When pus is pure, it does not readily putrefy; but in specific diseases, cases of necrosis, &c., it is often mixed with blood, or coagulating lymph, in which circumstance, it has more tendency to putrefy, and become offensive. It always partakes of the nature of the sore which produces it. To the surface secreting it, pus is quite unirritating, though sometimes its qualities are such, that they will greatly irritate any other parts with which it happens to come in contact. Hence, the inutility of wiping the matter so completely off the surface of granulations, as some are wont to do, though it is always highly proper to keep the surrounding skin free from it.

When any disease attacks a suppurating surface, or the constitution, the pus becomes thinner, more transparent, and more disposed to putrefy, and grow offensive. *Sanies* is the term frequently given to it in this degenerated state. Sanies may be very irritating to parts, so as to cause their absorption, but it never has the power of corroding them.

The changes in the appearance of pus arise more from the indolence and irritability of the parts producing the matter, than from disease. Many specific diseases, in healthy constitutions, produce no alteration in the appearance of the matter. Thus, the matter of gonorrhœa, of the small-pox pustule, and of chicken-pock, seems in each case to be made up of similar parts, consisting of globules floating in a transparent fluid, like the pus of a common sore, the specific properties of these diseases being superadded.†

Flakes of opaque coagulating lymph are frequently observed in the matter of indolent sores, and scrofulous abscesses.

The discharge from irritable ulcers is often thin, being chiefly composed of an irritating aqueous fluid, mixed with blood.

With regard to the uses of suppuration, the secretion of pus upon sores and wounds appears to promote the healing process by hindering the granulations from becoming dry, which state would be very unfavourable, not only for their requisite growth, but for all the minute processes, which take place in the advancement of cicatrization. Another design, answered by means of suppuration, is the discharge of extraneous substances, bullets, pieces of dead bone, &c. Here also we see the utility of the generally greater disposition to suppuration in superficial, than in deeply-seated parts; for, were a foreign body always to excite an abscess very remotely from the surface, the suppuration would only be an increase of mischief, whereas, when the extraneous substance is near the skin, and suppuration occurs, the abscess bursts, and the irritating body is discharged. From some late experiments, made by Sir Everard Home, it appears, that pus naturally contains a large quantity of carbonic acid gas, which, when the fluid containing the globules is inspissated, diffuses itself and quickly produces, by the passage of its bubbles, a net-work of anastomosing tubes or channels, supposed to become afterwards vessels. This is a subject, however, which requires further investigation.*

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* Op. cit.

† Sir E. Home on the Properties of Pus, 8vo. Lond. 1789.

If there were not some boundary to an abscess, some partition between the pus and the cavities of the cellular substance, the matter would diffuse itself extensively on all sides, like the air in emphysema, or the water in œdema. To prevent this circumstance, we find, that coagulating lymph is deposited immediately around the collection of matter; and, becoming organized, assumes the appearance of a membranous cyst. In abscesses of long standing, the cysts are often of very considerable thickness, while in other collections of matter, that have been sudden in their formation, and have not existed long, the surrounding lymph has scarcely had time to be converted into a vascular membranous cyst. The cysts of all abscesses are both secreting and absorbing surfaces. When the pus has been completely discharged by a puncture, the cavity soon becomes filled again with the same kind of fluid. Large and palpable collections of matter often disappear entirely, and in a manner only to be explained by the action of the absorbents.

Matter always tends to the surface of the body, making its way through a considerable thickness of parts, in order to arrive there. Even when there is but a delicate membrane between the matter and some internal cavity of the body, the abscess generally bursts externally, though it may have to make its way through a remarkable thickness of substance. Its progress is always aided by the relaxation of the skin situated immediately over the abscess. Here the skin is invariably looser, than when it yields to mere mechanical distention, unless the increase of the abscess be very rapid; and as the matter advances towards the surface, the intervening solid parts are absorbed.

The danger of abscesses depends upon their size, number, situation in vital, or other organs of consequence, or the effect of their pressure in impeding the functions of the heart, brain, respiratory organs, urethra, œsophagus, &c.

TREATMENT OF PHLEGMONOUS ABSCESSES.

The generality of phlegmonous abscesses soon burst of themselves, and need not be opened. When punctured unnecessarily or prematurely, fresh inflammation is excited, the pain is increased, the seat of the matter cannot be easily reached, and the cure is seriously retarded. The majority of abscesses which are superficial, or at a distance from parts of importance, may be left to burst of themselves. We may also defer opening such abscesses as are slow in their formation, and surrounded by a good deal of hardness of the contiguous parts.*

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* See Phil. Trans. 1818, p. 180—194.

Particular cases, however, should be opened as soon as the existence of matter is ascertained. When suppuration takes place in the sheaths of tendons, or beneath fasciæ, which invariably retard the progress of matter to the surface of the body, an early opening ought to be made. When this is not done, the matter spreads to a great extent, separating such ligamentous expansions from the muscles, and the muscles from each other. The necessity of this practice is often demonstrated in whitlows, abscesses under the palmar fasciæ, or the fasciæ of the thigh and fore-arm. Phlegmonous abscesses should not be left to break of themselves, when situated in extremely sensible parts, the distention of which would create intolerable pain. An opening is likewise necessary, when the collection of matter lies in a mass of adipose substance, and only presents itself externally, at a very limited point. † Of this nature are abscesses about the anus. Whenever the matter produces evils, resulting from its pressure upon particular organs, its discharge is urgently indicated; as in abscesses near the urethra and neck of the bladder; near the trachea, or larynx; very close to a bone, or in contact with it, under the periosteum. ‡ The best surgeons, however, do not exactly agree, whether the vicinity of an abscess to certain parts is a proper reason for making an early opening in it. Thus, Professor Thomson, and many others, conceive, that the situation of an abscess near a bone, or a large artery, renders an early opening necessary, because it is feared, that, in the first instance, the matter will cause disease of the bone; in the second, weakness of the parietes of the vessel, and hemorrhage, or aneurism. But, says another eminent author, when suppuration happens near a bone, the periosteum becomes thickened, as it were, for the protection of the part. Besides, pus is neither of a corroding, nor irritating nature. When in opening an abscess, which lies near a bone, this part is found affected with caries, or necrosis, it is because it has been originally affected; and, in this case, the abscess is the effect, and not the cause of the altered state of the bone. § On this point, however, it is but fair to state, that the most experienced surgeons, and amongst them Sir A. Cooper, generally consider the nearness of an abscess to a bone a good reason for making an early opening; for though the bone may sometimes be affected as soon as, or even sooner than, the soft parts, and though healthy pus has no corroding quality, yet, in other instances, the bone may really be secondarily affected in consequence of the pressure of the collected matter. As exceptions to this rule, Sir A. Cooper in his lectures instances cases, where a fluid exists between the pericranium and bone, unattended with any blush of the skin; but, says he, when such blush is present, an opening must be made, for the matter now formed will not be absorbed, and exfoliation is often unavoidable. With regard to the vicinity of a considerable artery to the abscess, it always happens that when, in cases of suppuration, the cellular substance around the vessel is destroyed, the arterial coats are rather thickened than rendered thinner, and they are afterwards covered with granulations, and blended with the surrounding parts. The truth is, I believe, that, although in open phagedenic ulcerations, arteries sometimes give way, such an event is never caused by the vicinity of a simple abscess. When matter is so situated as to be liable to insinuate itself into the chest, or abdomen, or into the capsular ligaments of joints, it is highly proper to prevent such an extension of mischief, by making a timely opening into the abscess. As Boyer observes, however, the risk of such an evil has been unduly magnified; for, besides the general security arising from that law, by which the matter tends towards the surface of the body, there is a further protection, derived from the thickening of the adjacent portion of the serous membrane, investing the above-mentioned cavities.

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* Thomson's Lectures, p. 336. Callisen, t. i. p. 318.

† Delpech, Précis des Maladies reputées Chirurgicales, t. i. p. 29. 8vo. Paris, 1816. Boyer, Traité des Maladies Chir. t. i. p. 60.

‡ Callisen, t. i. p. 319. Thomson's Lectures, p. 337.

§ Boyer, Traité des Mal. Chir. t. i. p. 61, 62., and Widemann de Necrosi Ossium.

Authors describe three principal ways of opening abscesses; viz. with a lancet; caustic; and a seton. In almost all cases, the lancet should be preferred; for, it opens the abscess more quickly than caustic, and with less pain; it occasions no loss of substance, consequently, a smaller cicatrix; and, by its employment, the opening may be made in the most advantageous direction, and of the exact size necessary.

The place, where the puncture ought generally to be made, is where the fluctuation is most perceptible; or where the conical eminence, or, as it is termed, the *pointing* appears; for, in this situation, the integuments are thinnest. It is also desirable, (if practicable with due regard to every thing else,) to make the opening in a depending situation, in order to allow the matter to escape as soon as it is formed. Collections of matter, beneath the fasciæ of the fore-arm and thigh, particularly demand attention to this precept, as they commonly point, where those ligamentous bands are naturally thinnest, not where the matter can most readily escape.

With respect to the size of the opening, the only general direction which can be given, is to make it large enough to let the matter escape with facility. When the pus is of thick consistence; contains flakes of coagulating lymph; or lies under a tendinous expansion; the opening should be larger than in ordinary cases.

A grand object in the treatment of most abscesses, after they have burst, or been opened, is to maintain such an opening, as will prevent any future lodgment of a large quantity of pus. When this indication is fulfilled, the cavity of the abscess soon contracts, and becomes filled up with granulations.

When an abscess bursts spontaneously, the opening is not likely to heal, as long as it communicates with a cavity into which pus is secreted; and, consequently, there is no occasion to take any measures to prevent its closing. But, when a collection of matter is deeply situated, and has been opened by an incision, the wound is very likely to close again, especially, if not in a depending situation. In this case, the surgeon must take care to insinuate a piece of lint between the edges of the puncture, and at every visit, introduce a probe.

When a phlegmonous abscess is extensive, and the skin thin, the opening should be made large, and in a depending situation. But, if the shape and size of the cavity of the abscess should prove impediments to the easy escape of the matter through a single puncture, or incision, one or more additional apertures ought to be practised in such places as seem most advantageous. When, however, a depending opening can be made, others are scarcely ever requisite.

When the collection of matter is extensive and deep-seated, or when the opening has not been practised in the most favourable situation for the escape of the pus, the matter burrows passages for itself, which sometimes reach a long way from the original and main cavity of the abscess. These passages, or sinuses, seriously increase the extent of the disorder, and, often having little tendency to heal, before they are laid open, render the treatment more difficult, and the cure more distant. Their direction, extent, and number can only be discovered by the probe, and sometimes not without the utmost difficulty. As they take place from the matter not having a ready outlet, of course, the first indication in the treatment of them is to make such an outlet; and, then, if they will not heal spontaneously, or with the aid of pressure, they must be traced with a probe, and fairly laid open to their very terminations, by means of a curved bistoury.

Some abscesses will not heal, though the matter easily finds its way out; and their internal surfaces will not produce granulations, unless a complete exposure of the cavity be made, and fresh inflammation excited. Abscesses about the arms, axillæ, groins, scrotum and labia pudendi, are often so circumstanced. It is true, however, that many of these cases are hindered from getting well by the cavity of the abscess not having an adequate, or a very direct external communication. Whichever of these explanations be most correct, no sooner is it certain that a cure cannot be effected by the milder means of a judicious posture, compression, or the use of a stimulating injection, than it becomes the duty of the surgeon either to enlarge the external opening, or lay the cavity completely open to its bottom.

When from any circumstances, preceding the formation of an abscess, there is reason to suspect the complication of a foreign body, the next indication to that of letting out the matter, is to search gently for the extraneous substance, and if loose, to remove it with the least irritation possible.

It was formerly the custom, after puncturing abscesses, to squeeze and press out every drop of matter, which they contained; a practice, attended with a good deal of pain and irritation, and no material advantage. It is therefore not imitated by the best surgeons of the present day, who generally leave the matter to ooze out of itself under the poultice. The old method of stuffing the cavity of the abscess with lint, or charpie, is also condemned, as occasioning needless pain, and opposing the gradual contraction of the hollow, in which the abscess is lodged.*

When a surgeon prefers to open an abscess with caustic, he generally employs the potassa pura, or this substance mixed with quicklime. The part is first to be covered with a piece of adhesive plaster, which has a portion of it cut out, of the figure and size of the opening intended to be made in the abscess. The usual way of making the eschar is to dip the end of the caustic in water, and rub it on the part, till the skin becomes brown. The active substance is then to be immediately washed off with some wet tow, the plaster removed, and an emollient poultice applied.

This method of opening abscesses is rarely advisable. Indeed, I know of hardly any case in which the practice is decidedly advantageous. It has been fancied, that the method is proper when the abscess consists of a small collection of matter, which has been long in forming, and is surrounded by a good deal of indolent hardness. The caustic, it is supposed, may then have a desirable effect in destroying some of the induration, and exciting the absorbents to remove the rest. It is believed, that the stimulus of the caustic will kindle a fresh and more lively action in the parts; one, that will be very serviceable in the cure. The most intelligent observers find, however, that all indurations, proceeding from acute inflammation, are more likely to be increased, than diminished, by caustic applications; and the plan, therefore, if proper at all, should be chiefly restricted to the preceding imperfect suppurations. It is sometimes adopted in cases of buboes, accompanied with much surrounding induration, partly on the foregoing principles, and partly for the purpose of making a largish, and more permanent opening, than a mere puncture, so as to lessen the chance of the skin healing too fast before the bottom of the cavity is sound, and to remove the hazard of the formation of sinuses.† The method, however, is always painful and severe, and certainly ought not to be indiscriminately nor frequently practised. It is a great objection to it, that it is impossible to prescribe any precise boundary to the action of the caustic, and that, unless the eschar be made sufficiently deep, the lancet must after all be employed. Caustic also invariably produces an ugly scar; a consideration of importance in abscesses about the necks and faces of females; and sometimes the eschar is not detached for nearly a fortnight.

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* Boyer, Traité des Mal. Chir. t. i. p. 67.

† See Pearson's Principles of Surgery, edit. 2, p. 68.

Professor Thomson, who entertains a just aversion to the method of opening abscesses with a seton, notices the circumstances in which the plan is ordinarily recommended. First, in large abscesses, where the skin is healthy, and capable of uniting to the opposite side, or bottom, of the abscess. Secondly, in cases where it is wished to draw off the matter of an abscess slowly. And, thirdly, in cases where it is wished to excite a certain degree of irritation in the cavity of the abscess. The seton has also been supposed to be particularly useful in large deep abscesses, into which we wish to prevent the entrance of air.* Now, as Dr. Thomson has not sufficiently exposed the absurdity of setons, and I conceive that the employment of them in the treatment of abscesses, especially those of the phlegmonous kind, is altogether wrong and pernicious, it behoves me to examine the reasons alleged in support of the practice. With respect to the first instance specified, why are we to use a seton *because the skin is healthy* and *disposed to unite to the subjacent parts?* Is it not as much as to say, a seton, a painful, irritating, extraneous substance, a foreign body, must be drawn across an abscess, *because such abscess is already inclined to heal?*

As for the second instance, in which the slow evacuation of the matter is desired, and given as the reason for a seton, such an indication never can occur in acute phlegmonous abscesses, though possibly it may do so in certain large chronic collections, especially *lumbar*, or *psoas* abscesses. After these have been opened, and their contents discharged, a series of alarming febrile symptoms not unfrequently ensues, which has been referred by some to the sudden evacuation of the matter; by some to its absorption; and by others, with more reason, to the inflammation of the extensive cyst of such an abscess, induced by making too free a puncture and leaving it open. † Now, admitting what may be rationally doubted, that suddenly emptying an enormous chronic abscess is worse practice than a gradual evacuation of its contents, cannot the surgeon avoid what is objectionable by making only a small puncture, which is on other accounts judicious, instead of a free incision? A large puncture, besides letting out the matter in the manner apprehended, excites too much irritation, at the same time that it facilitates the entrance of air into the cavity of the abscess, and the consequent putrefaction of whatever matter remains behind. The air, it is true, does not irritate the cyst; but, it promotes such changes in the pus with which it comes in contact, as render this fluid itself a source of considerable irritation and danger. None of these reflections, however, have any thing to do with acute phlegmonous abscesses, which are of a totally different nature. No dangers arise from their being suddenly emptied, or sufficiently opened to let the matter freely escape; and, of course, the reasons for applying setons to them entirely fail.

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* See Thomson's Lectures, p. 342.

† See Abernethy's Surgical Works, vol. ii. Obs. on Lumbar Abscesses.

The third reason, above specified, viz. the wish to excite irritation in the cavity of an abscess, would, I am convinced, never be urged by the strongest admirer of setons in cases of acute phlegmonous abscesses, where the wisest, most successful, and scientific practice, as universally acknowledged, consists in the use of soothing applications, and the avoidance of every thing irritating. All further comment on this reason is, therefore, superfluous.

A fourth alleged advantage of the seton is its preventing the entrance of air into the cavity of the abscess. But, how are we to suppose, that it can act in this way, while it allows a thick fluid, like pus, to issue? Besides, is the great and certain irritation, which the seton itself causes, to be rated lower, than that unproved, questionable kind of irritation, formerly imputed to the entrance of air into the cavities of the animal body? This doctrine originated, because irritation was often seen following incisions in such cavities. But, as the air in emphysema causes no irritation, and there is reason to suspect, that the same cavities would inflame if opened in a vacuum, the opinion seems entitled to little credit. It was a prejudice of this sort which blinded the eminent Dr. A. Monro * so completely, as to lead him to impute a man's death to the entrance of air into the pericardium, though a hot poker had been thrust into the chest! I can conceive, however, with Mr. Abernethy, that the admission of air into large chronic abscesses may be hurtful by causing putrefaction of the contained matter. I have never known any evils arise from the effects of the air on phlegmonous abscesses.

The best applications to phlegmonous abscesses are fomentations and poultices. While the skin covering the collection of matter continues entire, they are the best dressings, because they favour its relaxation, and accelerate the progress of the matter to the surface of the body. When the abscess has been opened, or has spontaneously burst, they are the most proper applications; for they promote the continuance of suppuration, without which, granulations cannot be produced to fill up the cavity. As soon as the cavity is nearly filled up, the more simple and superficial the dressings are, the better.

After inflammation has arrived at a certain pitch, cold applications and continued evaporation from the part affected avail nothing; on the contrary, they seem to augment the pain, and they probably do so by preventing the relaxing process of the skin. All the changes of phlegmonous inflammation are quick; if it is to terminate in resolution, it will generally do so in about a week or ten days: if it continues unabated beyond this period, suppuration may be expected, and perseverance in the use of cold astringent lotions only prolongs the disorder, by retarding what cannot be avoided.

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* On the Bursæ Mucosæ, p. 41 Also Discourses on the Nature and Cure of Wounds, by John Bell, p. 347. edit. 3.

When the abscess has completely formed: when it has been opened, or has burst, so as to emit daily a considerable discharge; and when the violence of the surrounding inflammation abates; the patient must be allowed a more generous diet. Animal food, wine, and fermented liquors, may now be given with advantage. When the discharge is so copious as to induce debility, attended with loss of appetite, bark, especially the sulphate of quinine, should be administsred. Opium may also now be given, either with the view of relieving the aggravated pain that immediately precedes the formation of matter, or of procuring sleep. Attention must of course be paid both to the prevention of costiveness, and of diarrhœa. The favourable progress of all considerable abscesses is very materially influenced by letting the patient have the benefit of a pure air, and removing him from a close, or crowded apartment.

CHAP. IV.

HECTIC FEVER.

HECTIC FEVER is essentially characterized by a frequent weak pulse, flushings in the face, the hands, or the feet, and profuse night sweats or diarrhœa. * The irritation of a local injury upon a healthy constitution produces that disordered state of it, termed the *symptomatic*, or *sympathetic inflammatory* fever. This is the *immediate* consequence of local irritation. The system, fatigued and debilitated by the continuance of a disease, which it cannot subdue, at length loses the power of entering into those strong actions, which characterize the preceding description of fever. However, exhausted as it is, it still sympathizes with the local irritation. The exciting cause, as Dr. Young remarks, is almost always some local disease, and generally a great, if not an incurable one; so that this fever seems to be a feeble and hopeless struggle of a constitution about to be overpowered, without any apparent tendency to the removal of the cause.† *Hectic* fever, contrasted with the sympathetic inflammatory fever, is to be regarded as the *remote* consequence of local injury, or disease.

The constitutional symptoms, which attend the formation of pus in long-continued, profuse suppurations, or which arise as effects of many obstinate and incurable local diseases, even without any suppuration, are generally comprehended under the name of hectic fever. There are, however, some well-informed surgical writers, who still believe, that hectic fever is in every instance connected, if not with the absorption, at least with the formation of pus.* My own observations do not allow me to entertain such an opinion. How commonly do we see patients suffering considerably from hectic symptoms in cases of white swelling, diseased hip-joints, tuberculated lungs, and curvature of the spine, long before any suppuration has taken place? I should say, that the long continued irritation of any severe local disease upon the constitution, whether accompanied with suppuration, or not, generally produces hectic symptoms. Dr. T. Young informs us, that, when he was 15 years of age, he had himself severe hectic, and every other symptom, usually attending the formation of pulmonary tubercles, though they never arrived at the period of suppuration. And, in another place, he correctly remarks, there are cases, in which a particular change in the state of the fluids, secreted by diseased parts, seems to bring on hectic symptoms, as when an abscess is opened, and the pus is exposed to the air. But, says he, this state of the fluids is not the only cause of hectic; for it often occurs, not only without an open abscess, but *without any abscess at all.* And, on the other hand, in cancerous cases, where there is a very unhealthy suppuration, with great pain, there is often no material hectic to the last.† It is true, at the same time, that hectic fever is most commonly preceded by suppuration; but the only reason of this fact probably is, that the greater number of local diseases, which come under the care of the surgeon, are in their advanced stages accompanied with ulceration, or abscesses. We see that certain local diseases, which cannot be called severe, though they secrete for a long time a great deal of purulent matter, do not bring on hectic symptoms. We may keep open an issue for a year, or the urethra may discharge a good deal of pus daily for an immense length of time in tedious cases of gonorrhœa, and yet hectic fever does not arise. Suppuration alone, unless exceedingly profuse, in which circumstance it must always be the effect of a severe form of local disease, is not to be regarded as the essential cause of hectic.

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* See a Practical and Hist. Treatise on Consumptive Diseases by T. Young, M. D. 8vo. 1815, p. 4.

† Op. cit. p. 10.

Neither does the hypothesis, which ascribes the cause of this fever to the absorption of pus, appear to have a better foundation. The inside of every abscess is both a secreting and absorbing surface, and by the combined action of the arteries and lymphatics, the matter is incessantly undergoing changes. This is a doctrine which is now professed by every modern pathologist. If then the absorption of pus were a cause of hectic symptoms, they would accompany every abscess, without exception. Yet, experience teaches us, that this is far from being the case; and that pus frequently lies in abscesses for a very long time, without the patient becoming hectic. Nay, we observe, that pus, even of the worst quality, may be absorbed without producing a single hectic symptom;

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* Thomson's Lectures on Inflammation, p. 326.

† P. 6. 10. and 53.

for we daily see the matter of phlegmonous abscesses, scrofulous suppurations, and venereal buboes, manifestly and entirely removed by the absorbents, and yet no hectic symptoms are the consequence.

Hectic fever comes on at very different periods after the commencement of any serious local disease. This is probably owing to peculiarities of constitution; or the particular structure and functions of the part, whose disease operates as a cause. The more delicate and feeble the patient naturally is, and the more severe and incurable the local disease, the sooner do the hectic symptoms generally begin, and the more rapid is their progress.

Sometimes the first accessions of this fever are almost imperceptible; a very slight degree of emaciation; a pulse a little quicker than ordinary, with a trivial increase of heat, particularly after meals, being the only early symptoms.* As the fever becomes more established, the symptoms generally run as follows: a frequent small pulse, which quickens towards evening, but is always ten or twenty strokes in a minute faster than in health; a moist skin; pale copious urine, with sediment †; a good deal of debility; the tongue seldom so much furred ‡ as in most other fevers, its edges being of a bright red colour, and the papillæ swoln and prominent; a florid, circumscribed suffusion of the cheeks; loss of appetite; sometimes an ejection of all food from the stomach; a great readiness to be thrown into sweats; profuse nocturnal perspirations; frequently a constitutional purging; repeated chills and flushes of heat; derangement of the nervous system; loss of sleep; indigestion; heartburn; flatulence. When, however, the biliary system is undisturbed, the digestive powers are little impaired, and the appetite remains good to the last. In an advanced stage, the hair falls off; and the nails become bent. §

Hectic fever is more or less remittent, but never wholly intermittent. It is observed, that the frequency of the pulse is generally from 100 to 140 in a minute; seldom falling below 100, even in the time of a remission, and, in some cases, never being under 120: while, in other constitutions, the pulse of health may be so slow that 90 strokes in a minute would be enough to indicate an exacerbation.||

The principal exacerbations generally occur about five in the afternoon: and, if we are to credit Galen, Vogel, and Wilson, who differ from Cullen on this point, an increase of the febrile symptoms always follows a full meal at any time of the day. The exacerbations, which are mostly preceded by chills, are marked by a sensation of burning heat in the palms of the hands, which become red and

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* Thomson, Op. cit. p. 323.

† According to Dr. T. Young, however, the state of the renal secretion is too various to assist in the distinction of the disease, Op. cit. p. 4.

‡ Where, however, the biliary system is deranged, the tongue is covered with a white coat, (Same author, p. 6.)

§ Dr. T. Young, p. 6. and 9.

|| Id. p. 4.

mottled, and frequently in the soles of the feet. A circumscribed redness is seen in the cheeks, the colour of which, in persons of a florid and delicate complexion, has also, during the remission, a more abrupt termination than in health. It has not been ascertained by the thermometer whether the temperature of the blood is actually reduced during the chills, which usually precede an exacerbation. Whatever may be the form of the exacerbation in the day time, they are generally succeeded towards the end of the night by copious sweats. When a diarrhœa supervenes in the latter stages of the disease, the sweat generally disappears. The reddish sediment of uric acid in the urine is generally observable after the sweats, and absent during the hot fit, when the secretion is usually pale and limpid. *

Mr. Hunter divides hectic fever into two kinds; viz. one, which arises from the absolute incurability of the local complaint; another, which depends upon a disease that is curable, if the patient's constitution had powers sufficient. †

TREATMENT OF HECTIC FEVER.

The exciting cause of every disease must be removed, ere a perfect cure can be expected. If copious and long-continued suppuration give rise to that affection of the constitution, denominated hectic fever, how can the febrile disturbance cease, while the discharge of matter continues? If the irritation of a scrofulous joint were to excite hectic fever, we should in vain expect to put an end to the constitutional disorder, unless the local cause were first removed. In short, as Dr. T. Young observes, the radical cure of symptomatic hectic fever can only be attempted by remedies calculated to remove the primary disease, on which it is dependent.

When the local complaint, connected with the fever, is totally incurable, the diseased part must, if possible, be removed by a manual operation. But, when the local disease presents the prospect of being cured, provided the state of the constitution were improved, the surgeon is to endeavour to accomplish the latter desirable object. Frequently, however, the nicest judgment is requisite to determine, how long it is safe to exert the power of medical surgery against the influence of an obstinate local disease on the constitution; for, although patients in an abject state of weakness, arising from irremediable local disease, have often been restored to health by a removal of the morbid part, yet many have been suffered to sink so low, that no future treatment could relieve them. Clemency in the practice of surgery does not consist so much in withholding strong and vigorous measures, as in deciding to practise them the very first moment when they are indicated.

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* Op. cit. p. 7—9.

† Treatise on the Blood, Inflammation, &c. p. 497.

When an incurable disease in an extremity is removed by amputation, the hectic fever immediately begins to abate. "I have known," says John Hunter, "a hectic pulse at 120 sink to 90 in a few hours, upon the removal of the hectic cause; I have known persons sleep soundly the first night, without an opiate, who had not slept tolerably for weeks before; I have known cold sweats stop immediately, as well as those called colliquative; I have known a purging stop immediately upon the removal of the hectic cause, and the urine drop its sediment."

But, though a radical cure of hectic can never be effected unless the primary disease be cured, or removed, the severity of this fever may often be palliated, and its progress retarded, by appropriate remedies. As weakness is one of the strongest features of hectic fever, blood-letting is never admissible; except, perhaps, in a very few examples, where the disorder is attended with unequivocal marks of inflammation in some vital organ. For the same reason, purging, particularly with the neutral salts, must be avoided.

I am afraid no medicine has the direct power of communicating strength to the human constitution; and, it is more than probable, that bark itself only proves serviceable in cases of hectic fever, by its sometimes improving the appetite and tone of the digestive organs. While the patient eats, and digests well, I believe, it is never of any service.

Bark was a medicine that filled the old practitioners with a blind sort of confidence in the worst of cases. They saw dreadful forms of disease, accompanied with hectic symptoms, sometimes get well, while their patients were taking bark; but they forgot the vis medicatrix naturæ, whose efficacy often conferred an undeserved reputation on this, as well as on many other articles of the materia medica. When first I entered the profession, it was the fashion to prescribe bark to a very great extent. Patients were sometimes literally crammed with it; they were frequently purged, sickened, and weakened by it, instead of being strengthened. Nature, however, occasionally overcame both the disease and the supposed remedy; and the ruling prejudices were confirmed. The best surgeons of the present day use bark much less frequently and copiously, than their predecessors. They sometimes give it in hectic fever, with the view of improving the appetite, but never on the supposition, that it can directly strengthen the patient in proportion to the quantity taken into the stomach. The infusion, decoction, or extract, is to be preferred to the powder, which has often been known to cause distressing sickness and obstinate diarrhœa*; but a still better preparation, now much used, is the sulphate of quinine. Dr. Young looks upon steel as the best tonic, when the hectic symptoms have somewhat abated, and general debility has taken place. It may sometimes be joined with myrrh, bark, and other bitters.†

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* Thomson's Lectures on Inflammation, p. 328.

† On Consumptive Diseases, p. 50.

The patient is much more likely to be strengthened by nourishing food, easy of digestion, than by bark, and it should be taken frequently, and in small quantities at a time. Residing in a pure, salubrious air, is also a matter of great importance. In these cases, wine, gentle cordials, and aromatic draughts, are sometimes useful, especially in relieving the heartburn, and flatulence.

Opium is also a valuable medicine, not only procuring sleep, and alleviating pain, but acting, especially when joined with ipecacuanha, as one of the best remedies for checking the diarrhœa frequently present.

Digitalis has been praised for its beneficial effects in hectic fever; but Professor Thomson, who tried it, did not find this commendation well founded. The frequency of the pulse, says Dr. Young, may indeed often be reduced by it from 120 to 50 strokes in a minute; but it is extremely uncertain in its operation, and frequently violent and unmanageable in its effects: nor is it either immediately or ultimately beneficial in simple hectic affections.* For checking the nocturnal sweats, diluted sulphuric acid is generally considered the best remedy, when the bowels will bear it.

When the local disease is curable, if the constitution could bear it long enough, or the health were improved, medicine may be availing; but the utmost, which can be expected from it in all other instances, is a temporary palliation of the symptoms. These, however, will recur, and in the end prove fatal, unless the diseased part, and the cause of the febrile disorder, admit of removal by a surgical operation.

CHAP. V.

MORTIFICATION.

BY the term, *mortification*, surgeons always mean the death of a part of the body, or the conversion of such part into a dark-coloured, black, fetid, cold, insensible mass, with which the general nervous and vascular systems no longer have any organic connection. In the bones, the state, corresponding to mortification of the soft parts, receives the name of *necrosis*.

The entire and unalterable cessation of every action and function in the part is absolutely essential in what is understood by mortification; for, sensibility and power of motion may be annihilated, and yet the part affected continue to live, as is daily exemplified in cases of paralysis.† Recent observations prove, that the temperature of a palsied limb is diminished‡; and so probably is the momentum of the circulation in it; still, the fluids pursue their usual course; nutrition and absorption are carried on; and the parts continue to retain, for an indefinite length of time, an inferior degree of vitality.

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* P. 49.

† See Boyer's Traité des Maladies Chir. tom. i. p. 105. Paris, 1814.

‡ Earle in Medico-Chir. Trans. vol. vii. p. 173, &c.

One of the properties of living matter consists in the power of resisting putrefaction, which the laws of chemical affinity would otherwise produce; but, as soon as a part mortifies, this characteristic property is lost; a spontaneous decomposition begins; different kinds of gas are formed; and the exhalations become fetid and highly offensive.

Numerous are the examples upon record, where the heat, sensibility, motion, arterial pulsation, &c. have been abolished in parts for several days, but afterwards gradually returned. This affection is as different from mortification as suspended animation is from actual death; and the discrimination of it is of the utmost importance, as otherwise there would be a continual risk of amputating limbs, not altogether past recovery. Such mistakes may be avoided by observing, that where the limb is only apparently lifeless, the cuticle does not separate as in a case of real mortification, nor does the spontaneous decomposition of the part begin, from which the putrid and intolerable smell, peculiar to the latter disorder, is derived.

The aspect and progress of mortification will be found to vary according to the cause by which it is produced.

The following are the principal causes by which the differences and peculiarities of the several cases are determined. 1. Inflammation attended with violence. 2. Inflammation attended with weakness, whether from a local cause, as certain modifications of structure, or from constitutional causes. 3. Inflammation of a specific or malignant nature, like particular forms of erysipelas, the carbuncle, boil, small-pox pustule, pestilential bubo, &c. 4. Great impairment of the constitution, whether brought on by previous disease, as in dropsical or scorbutic persons, or by intemperance, or by a gradual decay of the vital powers from old age. 5. Stoppage of the arterial or venous circulation in parts, with or without interruption of the nervous influence in them. 6. Great and severe degrees of mechanical injury from external violence, amounting to, what the French surgeons term, a disorganization of parts. 7. Applications which immediately and chemically destroy the flesh, like high degrees of heat, lightning, and a variety of corroding caustic substances. 8. Sudden exposure to warmth after intense cold. 9. Particular organic diseases of the heart and larger blood-vessels. 10. Certain deleterious kinds of food, such as the ergot or vitiated rye*, or barley mixed with the raphanus.* 11. Specific contagion, as exemplified in hospital gangrene.

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* See Dodard's Obs. in Journ. des Savans, 1676; Duhamel in Mém. de l'Acad. des Sciences, an. 1748; Langius, Descriptio Morborum ex Esu Clavorum Secalinorum; Phil. Trans. vol. iv.; Tessier, in Mém. de la Soc. Royale de Médecine, t. i. & ii., &c. &c. The accuracy of the statements concerning the deleterious effects of the ergot has been sometimes doubted; and all the evils which are supposed to arise from it, imputed to poverty and starvation. (See Bateman's

When mortification arises from external injury, it is uniformly preceded by inflammatory swelling and erythismus; the epidermis is detached, and vesications, containing a bloody serum, are produced; the cutis is softened, and acquires a blackish hue; the cellular substance and other textures are decomposed, so as to occasion not only the emphysema and crepitation, which are perceptible on touching the parts, but the formation of an abundance of fetid exhalations and moisture. Hence, this species of mortification is often named *humid* gangrene. We find, however, in the midst of this putrefactive mass, especially if the disease be not too rapid, some muscles, arteries, and nerves still in possession of a part of their living powers, and resisting, in a certain degree, the tendency to gangrene. Indeed, it is particularly to the early stage of mortification, while some marks of vitality yet continue, that many authors restrict the term *gangrene*. In it there seems to be a partial, but not a total destruction of the part; the blood still circulates through some of the larger vessels; and the nerves retain a portion of their sensibility. In the language of Galen, gangrene is a mortification, which, strictly speaking, is not actually formed, but forming, being the intermediate stage betwixt the height of inflammation, and the complete death of the part. The latter event receives the technical denomination of *sphacelus*, in which state the parts are generally of a dark brown or black colour, void of all natural heat, circulation, sensibility, &c.; and, in the language of surgery, called *sloughs*. Mortification always spreads more extensively in cellular membrane, than in the skin or muscles; a fact, particularly worthy of recollection, when amputation is to be performed.

Such are the phenomena of that species of mortification which is produced by wounds and other modes of external violence, and which is named by Larrey *traumatic*. †

It is very different from other forms of the disorder, which are sometimes termed *chronic*, or *idiopathic*, and are occasioned by internal causes, severe cold, &c. These last ordinarily attack the more remote parts of the body, where the vital powers are weakest, as the feet, hands, nose, and ears. The part affected becomes black; but, instead of being swelled, as in traumatic gangrene, it rather shrinks, becomes dry, and sometimes hard; on which account, such mortification has also acquired the name of *dry gan-*

Practical Synopsis of Cutaneous Diseases, p. 135. edit. 3.) But the experiments instituted by Tessier, and certain observations made in America, (see Gibson's Institutes of Surgery, vol. i. p. 38.) incline me to believe with Professor Thomson of Edinburgh, that the ergot, taken in certain quantities, has really a specific effect in producing mortification. See Lectures on Inflammation, p. 547.

* Linnæus, Amœnit. Acad. vol. v.

† De la Gangrène Traumatique, ou déterminée par une cause vulnérante. See Mémoires de Chirurgie Militaire, tom. iii. p. 143.

grene; particularly differing from the former in there being no effusion of fluids.

When any considerable portion of the body mortifies, the whole system generally undergoes a sudden and remarkable depression of all its powers. In such cases, however, as are accompanied with a high degree of inflammation, the disorder is attended in its first stages with inflammatory fever, the strong actions of which usually cease either before or as soon as the parts are in the state of sphacelus; and the alarming disorder of the system, sometimes called sympathetic irritative fever, ensues. The patient's countenance all at once assumes a wild cadaverous look: his stomach is severely disordered, vomiting generally occurs, and the diaphragm being affected with a frequent spasmodic contraction, a loud and troublesome hiccough is produced. The pulse becomes small, rapid, and irregular; the brain, especially in bad examples of traumatic gangrene, is soon affected with coma and delirium; the surface of the body is covered with cold, clammy perspirations; and the patient dies. In other cases, the course of the disease is slower; and the mortification would stop, and life perhaps be saved, if the weakening effects of a diarrhœa could be averted, or the state of the stomach improved.

The hiccough, which I have noticed, is a symptom which deserves particular attention; for it is an effect which is almost constantly excited on the first occurrence of gangrene and sphacelus. In particular, it is a symptom, of which every man of experience has a well-founded dread in cases of strangulated hernia, where it is nearly a sure indicator of gangrenous mischief within the hernial sac. *

Besides the two principal varieties of mortification, which receive the names of *humid* and *dry* from the state and appearance of the sphacelated parts, there is a third species of the disorder, which is peculiar in being of a contagious nature, and, as Delpech † observes, in being followed by a very rapid and singular mode of decomposition in the mortified parts, of which hardly any vestiges appear. No ordinary sloughs are seen; but, in lieu of them, the surface of the diseased part is covered with a whitish, or ash-coloured viscid matter, which exhibits at particular points specks of blood. This case is now well known amongst surgeons by the name of *hospital gangrene.*

The prognosis in cases of mortification differs according to the nature and inveteracy of the causes of the disorder, and the possibility or impossibility of diminishing or removing them. Much also depends upon the strength, constitution, and age of the patient; the greater or less importance of the part affected; the rapid or slow progress of the disease; and its extent. Great prostration of strength; a low, rapid, faltering pulse; a stomach which can retain neither food nor medicine; and bowels much disordered with diarrhœa; especially when joined with coma and delirium; are symptoms which leave little or no hope of recovery.

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* See Pott's Chirurgical Works, vol. ii. p. 68. edit. 1803.

† Précis des Maladies reputées Chirurgicales, t. i. p. 75.

As it is impossible to understand the present subject, without taking a separate view of each different species of mortification, I shall next endeavour to fulfil this task, with as much brevity as is consistent with truth and perspicuity.

1. In the account which has been given of inflammation, mortification was specified as one of its occasional terminations. This unpleasant occurrence is not, however, a common consequence of phlegmonous, or healthy, inflammation, in a sound constitution; except when the exciting causes have been unusually severe, or protracted in their operation. Thus, in cases of burns, gunshot-injuries, contused lacerated wounds, compound fractures, and other effects of great external violence, some of the flesh is frequently destroyed at once, and must be thrown off in the form of a slough; while other parts of it, not actually killed, are yet so injured, that they are seized with a violent degree of inflammation, which quickly ends in sphacelus. In other instances, as I have said, the inflammation ends in mortification, because the exciting cause continues to operate a long time, as we see exemplified in cases of extravasation of urine in the cellular membrane. Here the irritation of the urine immediately gives rise to inflammation; and its lodgment and increase of quantity in the parts are ordinarily followed by dangerous degrees of local mischief, in which urine, purulent matter, and sloughs are blended together.

The symptoms of mortification, as originating from intense inflammation, have been already detailed; and I shall, therefore, proceed without delay to the consideration of the treatment. In every species of the disorder there are three important indications to be fulfilled; namely, to stop its progress; to promote the separation of the mortified from the living parts; and to heal the ulcer resulting from the loss of substance.

1. With respect to the first of these indications, it naturally leads to the important object of ascertaining and removing the original cause of the disorder: I mean that cause which first gave rise to the intense inflammation of the parts, and which, perhaps, may still continue to operate. This is a common principle, which should be observed here, as well as in all other parts of surgery. Sometimes we have it in our power to remove the exciting cause altogether; as, when we let out, by suitable incisions, extravasated urine, and hinder its further effusion by the judicious employment of the catheter; or when we take away extraneous substances, splinters of broken bone, and remove and diminish irritation in a variety of forms. Frequently also sloughing is produced and kept up by the employment of hurtful remedies, and then the change to a better practice is the same thing as removing the cause of the disease in other instances, and has an equally beneficial effect. In general, however, when gangrene arises from intense inflammation, the exciting cause is only momentary: it has already ceased; but the

injury, which the parts have sustained from it, is of a more lasting nature, and must be followed by a high degree of inflammation, and sloughing to a greater or lesser extent.

There can be no doubt, that the extent of mortification may be considerably influenced by the mode of treatment adopted during its incipient stage, termed gangrene. When the disorder is the effect of inflammation, we are bound to believe, nay, we see, that the living circumference is inflamed in the highest degree. Reason and observation, therefore, seem both to concur with respect to the general propriety of antiphlogistic measures in this state and species of mortification. The plan, however, is to be pursued with moderation and caution. It is right, as long as inflammatory fever and acute local inflammation are co-existent with mortification; but, even under these circumstances, evacuations must not be resorted to with the same freedom and frequency, as in examples of inflammation unaccompanied with mortification. In particular, bleeding is to be ventured upon only in young, robust, plethoric subjects. The necessity of this kind of circumspection depends upon the fact, that, whenever a considerable portion of the body mortifies, the constitution immediately feels the shock in every part of it. There is hardly any interval between the genuine inflammatory fever, in which the action of the sanguiferous system seems to proceed even with preternatural force, and another state of the constitution, in which the predominating symptoms are prostration of strength, and violent agitation of the whole nervous system. In fact, more or less debility always rapidly supervenes; and if the patient be further lowered by the lancet, purgatives, and too spare a regimen, his condition will be rendered hopeless.

Some years ago, the treatment of gangrene and sphacelus was often conducted upon principles which had little foundation. It was presumed, that cinchona had a specific virtue in stopping and resisting the progress of the disorder. To this medicine, diluted sulphuric acid, or alum, was added, when a general tendency to putrefaction was suspected in the system; or cordials and aromatics, as wine, brandy, musk, ammonia, confectio aromatica, &c. when there was great prostration of strength; and opium, when severe nervous symptoms, and extreme pain were experienced.

This opinion, respecting the specific power of bark in the stoppage of mortification, is rejected by every modern surgeon of judgment and experience; without denying, however, that it is a medicine, which in particular states of the disorder, may be administered with advantage. Even, then, the benefit never arises from the specific power, which it was formerly supposed to have, of stopping mortification, but from its being an eligible bitter, by which the tone of the digestive organs may sometimes be improved. It is not long since it was the custom to prescribe it in powder, or substance (as it was termed), and in as large quantities as the patient could be prevailed upon to swallow. But as soon as it was clearly ascertained that the utility of bark did not really depend upon its specific virtue in stopping the disorder, the plan of cramming patients with it was universally abandoned; and it is now only administered in such moderate and reasonable doses, as are not likely to disorder the stomach and bowels, and defeat the very purpose for which alone it can ever be truly recommended. It is not, however, in the early stage of mortification, combined with acute inflammation, that bark, prescribed in any way, can be of service.

When mortification happens from an external local injury in a sound constitution; when it no longer spreads, and the living margin appears red for a small distance from the line of separation, bark is clearly unnecessary.

Mortification, according to its particular nature, causes, and circumstances, may be attended either with sympathetic inflammatory fever; or with another fever, which is characterized by extreme debility, and is either like typhus, or the disorder sometimes described under the name of *sympathetic irritative fever.*

The first fever takes place when mortification arises from external causes in a healthy constitution. Here bark is usually hurtful. The other state of the system may undoubtedly require it, though, if the fever be what is called sympathetic irritative, and great excitement of the nervous system, delirium, picking of the bedclothes, subsultus tendinum, &c. prevail, anodynes, antispasmodics, blisters, and local treatment, will do a thousand times more real good, if any chances of life still remain, than bark in any dose or formula whatever.

In condemning this medicine, however, for certain states of mortification, I am far from wishing the reader to suppose, that even in the progress of these very identical cases, it may not sometimes become necessary, although not at all indicated at an earlier period. Every experienced surgeon knows, that the natural change of circumstances in the course of numerous diseases renders the exhibition of some medicines absolutely indispensable, which, had they been given at first, would have had the most pernicious effects. When the inflammation surrounding the sphacelus has abated, the patient is low, the appetite bad, and the kind of fever and state of the chylopoietic viscera are not such as to prohibit bark, it should be administered with aromatic confection, wine, fermented liquors, and a light nutritious diet. The sulphate of quinine should also not be forgotten, as a very convenient preparation, which the stomach and bowels will generally bear well. If delirium occur, camphor or musk ought to be prescribed, and a blister applied to the head. In many of these cases, also, the patients would be carried off by diarrhœa, were not the surgeon particularly attentive to the diet, and prompt in the judicious administration of opium, the mistura cretæ, &c. Indeed, with respect to opium, it is one of the most valuable remedies in the generality of cases of mortification, and it should be employed in every stage and form of the complaint, attended either with severe pain, or spasmodic, or nervous symptoms. It ought not to be given merely at night, but every four or six hours, so as to keep the constitution under its influence.

With regard to local applications, in cases of mortification, attended with acute inflammation, experience appears to decide in favour of common emollient linseed poultices and fomentations. Mr. Hunter, however, did not think this practice always right, because warm applications seemed to him calculated to promote the increased action of the vessels supposed to exist in the process of inflammation, and, therefore, says he, "such remedies should be well adjusted to the case." On the other hand, he conceived, "that cold, when carried too far, debilitates or lessens power, but first lessens action." He concludes, however, with saying, "that the parts should be kept cool, and that all the applications should be cold." He justly condemns stimulants as improper, where the actions are already too violent; but he had seen benefit arise from opium applied to the part.* In general, however, as I have said, the preference is now given to emollient poultices and fomentations. When the gangrenous part is turned into a darkish, or black, fibrous, insensible mass, it is, indeed, of little consequence what is applied to it, as the living circumference claims almost exclusive attention. Both during the extension of the disorder, and afterwards, when the sphacelation has stopped, a simple linseed poultice, or one containing a proportion of finely powdered, recently burnt charcoal, is as good an application as can be employed. Some surgeons are partial to fermenting poultices, and with these not much fault can be found; for, though perhaps no particular good can be strictly imputed to their supposed antiseptic quality, the carbonic acid gas produced by them is not stimulating enough, nor sufficiently in contact with the living flesh, to counteract their good effects as emollient applications. † They have always appeared to me better calculated for mortification, unattended with intense inflammation, than for the particular cases which we are here considering. A few additional remarks on the topical treatment of mortified parts will be presently introduced.

2. The second general indication is to promote the separation of the mortified from the living parts.

Although a slough may be scratched, or cut, without pain or harm to the patient, it cannot be pulled away immediately after its formation, without pain, hemorrhage, and, even a risk of renewing the spreading of mortification. The dead part is yet adherent to the living flesh, and cannot be prudently taken away before the absorbents have removed the particles of matter, which compose the uniting medium. As a late author ‡ remarks, "the separation of dead from living parts is a vital process, not explicable on physical principles, nor by the laws of dead matter." When it is about to take place, a red line, varying in breadth in different cases, and said to be produced by the adhesive inflammation, usually appears on the living surface, contiguous to the dead. The adhesive inflammation, in fact, seems to be the means which nature employs for stopping the progress of mortification, and preparing the living surface for the separation which is about to be produced. By it, she fills the cavities of the cellular membrane, with coagulating lymph, assists in closing the extremities of the blood-vessels, and establishes the commencement of those operations, by which granulations are to be formed, and the loss of substance repaired. Soon after the formation of the red line of separation, slight solutions of continuity may generally be seen, beginning at various points, and resembling very minute ulcers, which, uniting together, form a hollow line, or chink, which extends all round between the dead and living parts.* This loss of substance, which is at first superficial, generally proceeds more and more deeply, till the separation of the sloughs is entirely effected. In this process, which does not materially differ from that of common ulceration, the absorbent vessels are actively engaged, and it is by them that the particles which form the link between the dead and living flesh are removed. From the moment that the separation commences, a discharge, at first of a serous, and afterwards of a puriform appearance, begins to take place from the line of detachment, and it becomes more and more abundant, in proportion as the falling off of the slough exposes the subjacent, raw, granulating surface. In young subjects, and in vigorous constitutions, the separation of the sloughs is accomplished with much more celerity than in the old and feeble. The texture and situation of the parts affected, make also a considerable difference in this respect, and, generally speaking, the harder and less vascular they are, and the more remote from the source of the circulation, the longer they are in throwing off their sloughs.

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* Treatise on the Blood, &c. p. 9.

† The following is the formula used at St. Bartholomew's Hospital. ℞. Farinæ Tritici, Cerevisiæ Spumæ *Yest* dictæ sing. lbss. Misce et calori modico expone, donec effervescere inceperit.

‡ Thomson's Lectures on Inflammation, p. 383.

When a part, or limb, is seized with mortification, the blood coagulates in the large vessels, for some distance from the line which bounds the sphacelation. Hence, the separation of the sloughs is not usually attended with hemorrhage, and the security is generally still further increased by the effects of the adhesive inflammation already described.

The cause of the formation of the coagulum in the vessels, as Mr. Hodgson remarks, is by no means evident, although it is probable, that the condition of a mortified vessel may interrupt the passage of the blood through it, and, consequently, a coagulum is formed, extending to the next important collateral branch. It is also the coagulation of the blood in the arteries, near a sphacelated part, which accounts for there being sometimes no hemorrhage of importance, nor any occasion for ligatures, when amputation is performed a little above the line of separation. *

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* Op. cit. p. 384.

Excepting in cases where amputation of the limb is urgently indicated, the separation of a slough should generally be left as much as possible to nature. All that the surgeon can usefully do is to take away every portion of the slough as soon as it is entirely separated from the living flesh. An opposite line of conduct would often excite unnecessary irritation, pain, hemorrhage, and even a renewal of the spreading of the disorder. It is almost inconceivable what little violence will sometimes bring on the latter evil, nor can we be surprised at it, when we advert to the deranged state of the whole constitution, always resulting from the effects of an extensive mortification. If it be at all practicable to expedite the process by which a slough is thrown off, the good is to be derived rather from general, than from local treatment. I know of no applications which have any particular virtue of this kind, and the more simple they are, the better. In fact, none are better than common linseed poultices, with or without a proportion of powdered charcoal; or, if the surgeon like, he may have recourse to the fermenting cataplasm already specified. Much stress has been laid upon the topical use of antiseptics and tonics. Of the former, various powerful stimulants, like oil of turpentine, camphorated spirit, &c. have been tried; of the latter, bark in a variety of shapes, has been used for covering the parts affected. As I have repeatedly said, it matters not what is put upon such parts as are actually dead, and, if the surgeon choose, he may lay upon them turpentine, spirituous balsams, camphorated spirit, or any thing else which he may prefer, with a view of checking the fetor and putrefaction of the sloughs. But, it is of high importance, that the living flesh around and underneath a slough, be not injured and irritated by any sort of applications. No one who has sound ideas of the nature of the animal economy, would talk of invigorating the parts with spirits and balsams, in order to avert mortification. Yet, once so prevalent was this doctrine, that it was a frequent practice to cut and scarify the parts for the express purpose of letting such applications have free ingress to the subjacent living flesh.

Incisions and scarifications in gangrenous parts can do no good, if they are merely made in the sloughs; and, if they extend through the dead to the living flesh, they are not only likely to effect no rational purpose, but must be productive of pain, hemorrhage, and frequently of fresh sloughing. When, however, a slough is large, and a part of it loose, the cutting away such portion is commendable on the principle of lessening the fetor. Were also much sanies to lodge under a slough, a careful incision through the dead part might be useful in affording an exit to the matter. But the pro-

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* See Petit's Obs. in Mémoires de l'Acad. Royale des Sciences, an. 1732. Thomson's Lectures, p. 552., and Hodgson's Treatise on the Diseases of Arteries and Veins, p. 15. 8vo. Lond. 1815.

ceeding can never be justifiable, when the living parts are to be at all irritated or wounded.

OF AMPUTATION IN CASES OF MORTIFICATION.

I have remarked, that, in general, it is the best practice to leave the separation of a slough as much as possible to nature. This observation, however, does not apply to certain cases, in which the sphacelus affects the whole thickness of a limb; for here the surgeon is to seize the right opportunity of performing amputation. It is true, that, even in these examples, if the patients lived long enough, nature would also complete the detachment of the dead parts; the soft parts would first separate down to the bone, the bony connection itself would afterwards be destroyed by the slow process of exfoliation, and the ulcer finally heal. * But, in general, the patient would not outlive the effects which these tedious changes must have upon his health; and sometimes the extension of the mortification itself would carry him off before they had well commenced. In the most favourable cases, also, the sore would not generally heal so as to leave the extremity of the bone well covered with flesh, and with a cicatrix capable of bearing pressure. Therefore, besides the risks and tediousness of this mode of cure, the production of a sound and serviceable stump commonly renders the operation indispensable.

The exact time when amputation should be done, is a question of the first-rate importance. The rule, generally laid down, is never to perform the operation before the mortification has stopped, and a line of separation appears between the dead and living parts. This maxim, when followed, in regard to mortification proceeding from internal or constitutional causes, is entitled to every degree of respect, and, were it neglected, the stump would often become gangrenous, and the patient's death only be accelerated.

In a few instances, amputation may even be deferred beyond the period when the sphacelation of the limb has ceased to spread, and the red line on the living edge denotes the commencement of the separation. Such is the case, when the patient is so reduced at this critical moment, that he would be likely to die under the operation. Here, a little delay may sometimes be allowed with advantage; the dead parts will separate from the living down to the bone, and, if the discharge be moderate, the constitution, with the aid of suitable diet and medicines, will soon recover sufficiently from its depressed state, to be capable of bearing the operation with a better chance of success.

Baron Larrey, as I have already mentioned, has applied the term *traumatic* to the species of gangrene which follows wounds and external injuries. In cases of this nature, which expose the life of the patient to danger, he says, " amputation should be performed without awaiting the appearance of the line of separation between the dead and living parts." Here, he observes, " it would be dangerous to defer the operation, because the mortification is readily transmitted from the part primarily affected to the rest of the extremity, and he has seen instances in which it proved fatal in the short space of six hours." He asserts, that there is no reason to fear the reappearance of gangrene upon the stump, for, whenever mortification arises from external injury, it can only be propagated by absorption and the continuity of vessels. Therefore, says Larrey, if amputation be performed at a proper place, that is, where the skin preserves its integrity, it will arrest the progress, and prevent the fatal termination of the disease. These observations are accompanied with many interesting cases, which, with others recorded in this country, seem to establish the propriety of the practice beyond dispute.*

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* See facts on this point in Kirkland's Enquiry into the Present State of Medical Surgery, vol. ii. p. 380.; and Sir A. Cooper's Lecture *on Gangrene*, &c.

When mortification originates from the united effects of external violence and the injury of the main artery of a limb, we are not to be governed by the old rule of waiting for the line of separation, before resorting to amputation. Thus, as Mr. Guthrie has particularly pointed out, when a gunshot-injury of the femoral artery and vein is followed by gangrene, which begins at the extremity of the limb, the surgeon must not defer the operation till the mortification stops; for, if the wounded vessels be in the middle of the thigh, it will extend to the seat of the injury, and destroy the patient before any line of separation is formed. Here amputation should be done as high up as the wound of the vessels, and early, that is to say, as soon as the nature of the case is certain, and before the sphacelation has extended beyond the foot.†

Analogous to the preceding species of gangrene is that sometimes following the application of a ligature to the main artery of a limb for the cure of aneurism, or the suppression of hemorrhage. Here, the mortification also generally commences at the extremity of the limb. Whatever may have been inculcated, with regard to other instances of gangrene, this is a case in which the early performance of amputation at some distance from the dead part has always been recommended.

In many accidental injuries, the operation should be performed without any delay, so that mortification may have no time to begin. Numerous gunshot-wounds of the extremities, badly lacerated and contused wounds, and severe compound fractures, will inevitably be followed by gangrene, and the patient's death, if an imprudent attempt be made to save the part. Here amputation should be done immediately after the accident, the wound of the operation being infinitely less hazardous than an extensive and spreading sphacelus.

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* Larrey's Mémoires de Chirurgie Militaire, t. iii. p. 141. Lawrence in Medico-Chir. Trans. vol. vi. p. 184. A. C. Hutchison's Pract. Obs. in Surgery, p. 75, &c.

† See Guthrie on Gunshot Wounds of the Extremities, p. 59, &c. 8vo. Lond. 1815.

3. The third general indication in the treatment of mortification is to heal the ulcer, or, in the event of amputation, the wound, resulting from the loss of substance. But on this topic I need not dwell at present, as the principles, on which this indication is to be fulfilled, are explained in the respective chapters on wounds, ulcers, and amputation.

MORTIFICATION FROM INJURY OF LARGE ARTERIES AND NERVES.

In the arrangement of the arterial system, nature seems as if she had foreseen the danger that would arise from an interruption of the supply of blood, and she has, therefore, so multiplied the reciprocal communications or inosculations, in all the different orders or branches of this system of vessels, that the largest trunks are tied almost daily by the enterprising hand of the modern surgeon, and yet, if there be not other causes concerned, this single one is rarely followed by mortification. She appears, however, not to have extended in an equal degree a similar cautious and provident arrangement to the nerves. The destruction of a principal trunk, in this latter system, is invariably followed by paralysis; and, when this circumstance is coupled with the division or ligature of the principal artery of the same limb or part to which the branches of that nerve are distributed, the chances of mortification are much increased. There are, however, some facts recorded, which prove, that the communications of some of the smaller nerves are sufficiently direct to qualify them to become, in point of function, substitutes for each other.

I have said, that the division, or ligature, of the main artery of a limb and of the principal nerve, together, may occasion mortification. Cases are related, however, in which the consequences were only a paralysis and wasting of the member. But Delpech, in considering this subject, remarks, that he knows of no instances of this kind, where the lower extremity was the part concerned; and, with respect to the arm, which is not supplied by a single nerve, hardly any sort of accident can injure the whole of the brachial plexus; the median being the nerve, which is commonly wounded, or tied, with the artery. He observes, however, that notwithstanding the advantage of several nerves, it has almost always happened, that when the nerve accompanying the axillary artery has been included in a ligature with it, the limb has mortified. *

It is true, that, in many of these cases, we are also to take into the account the share which a large, extensive wound of the soft parts, or their contusion, laceration, &c. have in the production of gangrene. We rarely or never see a case, in which the injury simply consists in the division, or ligature, of the main artery and one of the principal nerves of a limb, unaccompanied either with great additional injury, much weakness from the profuse and sudden hemor-

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* Précis des Maladies reputées Chirurgicales, t. i. p. 98.

rhage, the irritation of a previous operation, the injection of the cellular membrane with blood, or a diseased state of the member, any of which conditions may be such as to have considerable influence in bringing on gangrene. On the whole, perhaps, we are not yet authorized to infer, that the mere interruption of the circulation through the main artery of a limb, and the simultaneous stoppage of the nervous influence derived from one of the principal nerves of the member, would generally occasion mortification, if there were no other additional violence, nor injury, existing in the part or constitution.* Whatever may be the result of future experiments upon this point, no doubt, I think, can be entertained of the fact, that when the stoppage of the circulation through the main artery of a limb is conjoined with loss of the nervous influence in the same member, there is always a much greater risk of mortification, than if the case were simply an interruption of the flow of blood through the vessel. Indeed, so great is the success which now attends operations on aneurism, that I might perhaps assert, with perfect accuracy, that gangrene never arises solely from the ligature of an arterial trunk, unless the patient be of advanced age; the circulation languid from previous debility; many of the collateral branches destroyed, or injured; or some other important cause co-operate in producing the evil.

When mortification follows the ligature, or division, of a principal artery and nerve, the part is from the first cold, insensible, heavy, benumbed, and motionless; its natural heat is permanently lost; the pulsation of its arteries cannot be felt; the cuticle separates; the skin becomes brown and shrivelled; and fetid exhalations soon leave no doubt of the nature of the mischief. This species of gangrene is usually very extensive, being a sphacelus affecting the whole of the limb. It is somewhat less dangerous when it comes on later, and begins at the extremity of the limb; under which circumstances, its progress is ordinarily slower, and its effects sometimes restricted to a partial destruction of the member.

When once this kind of mortification has arisen, every means which it is in the power of the surgeon to adopt will be found insufficient to stop its progress. Hence, in tying the main artery of a limb, too much care cannot be taken to exclude from the ligature the accompanying nerve. We should also avoid every thing which is likely to obstruct the circulation through the collateral branches and capillary system of vessels. In operations for aneurism, the wound should not be larger, nor deeper, than necessary; all compression should be removed; and the limb kept moderately warm.

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* In company with Mr. George Young, I assisted Mr. Lawrence at an operation, in which he divided by a circular incision, not only the principal arteries and nerves of the finger, but every fibre of the part, with the exception of the tendons and bone. Yet, contrary to all expectation, the blood still gushed profusely from vessels, which could only receive their supply of blood through the medium of such ramifications as passed through the tendons and bone. It was equally curious, that though the principal arteries and nerves were all fairly divided, and the cut carried entirely round the part, mortification was not the consequence. The operation succeeded in checking the progress of an aneurism by anastomosis, which had increased and become attended with many unpleasant symptoms, notwithstanding the radial and ulnar arteries had both been previously taken up by Mr. Hodgson. Some account of this case is given in Medico-Chir. Trans. vol. ix. part. 1. p. 216.

Several eminent surgeons have thought, that the best way of preventing this species of mortification, in aneurismal cases, would be to effect a gradual constriction of the artery, so that the flow of blood through it might partly continue, until the circulation was well established in the branches of the vessel. But, as Delpech judiciously remarks, this plan cannot be kept up long enough to be of much service in promoting the circulation; and experience has proved, says he, that it is liable to the very great objection of partially destroying the circumference of the artery, without holding its parietes in contact, and of thus occasioning a dangerous, and even fatal hemorrhage.* Besides, as I have already observed, gangrene rarely or never comes on simply from the ligature of the trunk of an artery; and under favourable circumstances, the inosculations are always sufficient: other causes must, therefore, be concerned. The avoidance, or (if possible) the removal, of these would be a much more important object in the prevention of gangrene, than the dangerous experiment of a gradual and incomplete compression of the arterial trunk.

When the case is decidedly an extensive sphacelus, I believe the only chance of preservation depends upon the immediate performance of amputation, high up; and, if practicable, above the place, where the artery, or the artery and nerve, have either been divided, or tied. In certain examples, however, in which the first appearance of mortification does not happen till some days after the injury, when the sloughing occurs at the extremity of the limb, and is slower in its advances, the disorder will sometimes terminate in a partial destruction of the integuments of the hand, or foot, and the limb may be saved. But here the surgeon must be most vigilant; for if, in his anxiety to avoid operating, he give the disease time to extend up the limb, the patient will certainly lose his life.

MORTIFICATION FROM PRESSURE.

Somewhat related to the kind of mortification, which we have just now described, is that which originates from pressure, whereby the circulation in the smaller vessels, and the nervous influence in the parts, are interrupted. However, the great extent of the capillary system, and the prodigious number of its inosculations, make the circulation in it so free, that it must be a powerful and long-continued pressure to stop this important function. The cause may act either upon a limited point of the external surface of the body, or upon the whole circumference of a limb; and, in both instances, the effect may extend to a greater or lesser depth.* When the constitution is enfeebled, pressure much more readily brings on mortification. Of this, every surgeon of experience must have seen repeated proofs in the mortification which attacks the integuments covering the sacrum, os ilium, trochanter major, and scapulæ, in patients who have been long confined in bed by fevers, injuries of the spine, bad fractures, &c. The constant pressure of such parts of the skin, between the bedding and bony prominences, obstructs the circulation through them at a period when the flow of blood is already languid from general debility. They become soft, lead-coloured, red at the circumference, œdematous, and, at last, black and senseless.† The sloughing commences at the point where the pressure is greatest; thence spreads more or less widely, and terminates in the formation of a foul, ill-conditioned, gangrenous ulcer. Some cases present themselves, in which the skin is so extensively destroyed, that, upon the separation of the slough, the sacrum and neighbouring bones are denuded, and visible at the bottom of the ulcer, the discharge and irritation from which are terrible. Patients sometimes get over severe fevers, bad fractures, &c. and ultimately fall sacrifices to this secondary disease.

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* Précis des Maladies reputées Chirurgicales, t. i. p. 100.

With respect to the treatment of this particular case, I need not remind the practitioner, that he should always be apprehensive of this species of sloughing in patients, who are weakened by disease and long confinement, and compelled to lie for several weeks and months in bed. He ought, therefore, to prevent the occurrence by now and then shifting the posture of the sick; and, especially, he should not forget to examine from time to time the state of the parts, most subject to attack. On the first appearance of any redness, or discoloration in them, they may be bathed with the liquor plumbi acetatis dilutus, and then covered with a piece of the emplastrum plumbi, or, what is still better, the emplastrum saponis. The posture should at the same time be so altered, that the parts affected may not be lain upon. The judicious arrangement of small pillows, or cushions, under particular points, will often give the surgeon essential assistance in the accomplishment of this highly important indication. When sloughing and ulceration have actually taken place, some surgeons apply lint, dipped in camphorated spirit, or turpentine; others carrot, or emollient poultices; others a solution of opium and common pledgets. This indetermination, respecting what is really the best kind of dressing, sufficiently proves to my mind, that not much is to be expected from the virtues of local applications. Improving and strengthening the constitution; changing the patient's posture; and, above all things, the strictest attention to keeping the parts affected clean, and to the avoidance of whatever is irritating to them; are the great leading principles by which the surgeon should be governed.

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* Précis des Maladies reputées Chirurgicales, t. i. p. 101.

† Richter's Anfangsgr. der Wundarzneykunst, b. i. p. 75.

The circular compression of limbs by tourniquets and tight bandages, if continued too long, will induce mortification. The smaller the extent of the compression, the greater is the risk; and bandages, which operate equally upon every part of a limb, though they may be somewhat tenser, can be borne with greater safety than a narrow band, or ligature, which acts only upon a very confined space. Yet, let it not be imagined, that the danger of immoderate, long-continued compression is entirely obviated by equalizing the pressure, and increasing the extent of the compressed surface. There are few surgeons who have not beheld melancholy proofs of the fatal consequences of tight bandages. The greater skill now generally evinced in equalizing the pressure upon the whole limb, we must admit, has much diminished the number of these unfortunate examples; but they do still sometimes happen. A surgeon, therefore, should never forget, that, frequently when he is applying a roller, the nature of the disease or injury will necessarily be followed by a great deal of swelling, and for this due allowance should be made in first putting on the bandage. For the same reason, the part should be from time to time carefully examined, and if found to be too much constricted, it should be instantly liberated. Compression is only safe, while it gives no uneasiness; and, when it appears to produce pain, the suspicions of the practitioner ought to be immediately awakened to its dangers. In the practice of surgery it is sometimes proper to wet bandages with cold water, or particular lotions; but, whenever this is done, the fluid makes the bandage shrink so considerably that, if the change be not guarded against, the constriction produced will often bring on a rapid mortification of the limb, and the death of the patient. Let surgeons also continually bear in mind, that tourniquets are only designed as temporary means of suppressing hemorrhage, and that if their application be long continued, they will surely have the most disastrous consequences.*

The perils of immoderate circular compression of limbs proceed, not only from the obstruction which it causes in the circulation, both through the arteries and veins, but also from the interruption of the nervous influence and action of the absorbents.

With regard to the treatment, the indication in an early stage of the mischief is very simple, viz. to remove the bandage, or tourniquet, and have recourse to fomentations, or applications of a discutient, spirituous quality.

When the disorder has advanced further, and actually amounts to gangrene, the conduct of the surgeon must be regulated by the extent of the mischief. If it be partial, let him, after removing the compression, foment the parts and vigilantly observe the changes which occur; for it is the nature of this species of mortification often to spread with incredible rapidity up to the very trunk, and thus in a few hours destroy every possibility of saving either the patient's limb, or his life. Whenever there is reason to apprehend, that the case will be of this serious description, if amputation be delayed, the operation should be adopted as the only possible means of affording the patient any chance of life.

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* Amongst the thousands of cases recorded in proof of this fact, I shall merely refer to one related by a distinguished modern writer, Flajani, Collezione d'Osservazioni et Riflessioni di Chirurgia, tomo ii. p. 26. Roma, 1800.

MORTIFICATION FROM DEBILITY, IMPAIRED CONSTITUTION, ADVANCED AGE, AND OSSIFICATION OF ARTERIES.

The next examples of mortification, which I shall notice, are those which probably arise from the combined effects of great general debility, an impaired constitution, advanced age, and, perhaps, an ossification of the arteries. Whether this last occurrence, however, should be received in the list of causes, is not entirely settled. We know that, in elderly subjects, some of these vessels are commonly found in an ossified state, and yet the parts which they supply with blood appear in general to have no tendency to gangrene. This fact is established by observations daily made in every dissecting room, and it is an undeniable proof, that ossification of the arteries cannot alone, and without the concurrence of other causes, produce mortification. As also the species of mortification about to be described, mostly occurs in elderly persons, one must naturally expect to find these vessels sometimes ossified in the limbs affected; which is actually the case. But the coincidence of this state of the vessels with gangrene is far from justifying the conclusion, that the disorder arises from it as a cause; since, in subjects of the same age, the arteries are often found similarly changed, and yet the parts, which they supply with blood, are not at all disposed to gangrene. At the same time, I am far from denying that ossification of the arteries may not, when joined with other causes, facilitate the access of mortification; because one can hardly suppose such an alteration of structure unconnected with some diminution of the momentum of the circulation through the ossified vessels. The case of mortification, now engaging our attention, is one which differs, as much as any example which can be pointed out, from that which follows common, or any other species of active inflammation. It is peculiar in being often only preceded by a burning pain in the part, which undergoes no swelling, and is sometimes of a pale-red, or livid colour. It constantly attacks parts at the greatest distance from the source of the circulation, and hence frequently begins in the toes, and sooner or later passes on to the foot and ankle, and sometimes to a part of the leg. In a few instances, it makes its appearance with little or no pain; but, in most cases, the patient feels great uneasiness through the whole foot and ankle-joint, particularly in the night, even before these parts show any mark of distemper, or any thing else than a small discoloured spot on the end of one of the little toes. If the patient has lately cut his nails, or corns, it is frequently, though very unjustly, set to the account of such operation. It is most frequent in men, and oftener attacks great eaters, than free drinkers. I have never seen it in any patient under forty-five. When once the mortification is fairly established, the constitution sinks with great rapidity. The sympathetic irritative fever generally comes on in its worst form, attended with intolerable restlessness; a small, frequent, irregular pulse; delirium and spasmodic twitches; and many patients die by the time the disorder has extended as high as the ankle. This case is further remarkable, on account of the inefficacy of bark in its treatment. Pott regarded opium as the best medicine for stopping the extension of the disease*; though his account of its effects in this case have been considered by some others as exaggerated.† Wine, camphor, and subcarbonate of ammonia, have also obtained repute. The topical applications should be of an emollient, unirritating kind. Amputation scarcely ever succeeds, if done while the mortification is spreading.

CHAP. VI.

ERYSIPELAS,

IS the name commonly given to a peculiar kind of inflammation of the skin, characterized by a diffused redness and fulness of the part, a burning, or itching pain, and frequently vesications and fever. When touched with the end of the finger, a white spot is left, which immediately turns red again. The skin has a shining appearance, feels as if it were a little thickened, and somewhat less pliable than natural; and whether complete vesications have been formed, or not, the cuticle peels off on the decline of the inflammation. The affection has a tendency to spread extensively and rapidly; coagulating lymph is not freely effused in the cellular membrane as in common inflammations; and when suppuration unfortunately occurs, as it sometimes does, the matter not being bounded by adhesions, diffuses itself, and becomes blended with sloughs under the integuments. According to some writers, erysipelas is distinguished from erythema, by swelling and vesications ‡; but these two symptoms frequently rather depend upon the stage and degree of the complaint, than upon its essential nature; because its beginning is never attended with them. If the terms *erysipelas* and *erysipelatous inflammation*, as applied to the local affection of the skin, could be conveniently exchanged for *erythema* and *erythematous*, as Dr. Good has suggested, a great deal of confusion in this subject might be avoided; for the word *erysipelas* might then be restricted to the idiopathic fever, which is necessarily followed by this kind of inflammation as a symptom, and the inflammation itself, in this, as well as other examples from different causes, might have the generic name of *erythema*, with an epithet expressive of its particularity. Thus, in erysipelas, it is proposed to call it *erysipelatous erythema.*[*] Certainly a specific fever, followed by this cutaneous efflorescence merely as one of its symptoms, should not be confounded with other cases, in which no general febrile disturbance of the system precedes the local complaint, which arises from causes of a different kind, and itself consists of several varieties.

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* See Pott's Observations on the Mortification of the Toes and Feet; Chirurgical Works, vol. iii. Also, Quesnai's Traité de la Gangrène, p. 324. &c. Paris, 1749.

† See Kirkland's Medical Surgery, vol. ii. and Gibson's Institutes of Surgery, vol. i. p. 31. 8vo. Philadelphia, 1824.

‡ Bateman's Synopsis of Cutaneous Diseases, p. 125. ed. 5.

Mr. Hunter seems not to have limited his conception of erysipelatous inflammation always to an affection of the integuments, but believed, that though the skin is the part which it mostly attacks, there might be constitutions in which every inflammation, whereever it existed, would be of this kind. Here Mr. Hunter probably meant, that the inflammation, so situated away from the skin, would be chiefly marked by a greater tendency to spread than simple inflammation, and less disposition to effuse coagulating lymph; for many of the other characters of erysipelatous inflammation, noticed in the skin, would be lost in deeper textures. When, also, erysipelas shifts its situation, and moves either to a distant part of the skin, or to an internal organ, (erysipelas metastaticum,) as described by medical writers, the possibility of this kind of inflammation taking place in other parts besides the skin, is distinctly implied. At the same time it is admitted, that the skin is the most susceptible of erysipelatous inflammation, which will spread extensively over it, without materially affecting, at least in ordinary cases, the subjacent cellular membrane.[†] The margin of erysipelatous inflammation is abrupt, the redness not being imperceptibly lost in the surrounding surface, like that of phlegmonous inflammation. In erysipelas, there is less extravasation than in phlegmon and œdema, and little or no effusion of coagulating lymph. Adhesions, therefore, are seldom formed, by which the spreading of the complaint can be checked, or boundaries set to abscesses when they unfortunately occur. In these cases, indeed, suppuration rarely happens, without being attended with considerable sloughing of the fasciæ, tendons and cellular substance under the skin, which latter part, being itself highly organized, frequently escapes, even when the sloughing of other less vascular parts is very considerable.

This kind of suppuration and mortification is principally seen, either in severe cases of *phlegmonous erysipelas*, where the inflammation extends more deeply than common, so as to affect a great deal of the cellular membrane; or else in those forms of the disease, which are attended with typhoid fever, and have been distinguished by the epithets *gangrenous* and *malignant.* Whenever erysipelas falls into this unfavourable state, the surgeon finds air, matter, and sloughs, all blended together under the skin, and, on handling the part, a strange feel is communicated, neither like that of fluctuation, nor that of crepitation.* The discharge also becomes peculiarly offensive; not being genuine pus, but a purulent secretion blended with sloughs and other extraneous matter.

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[*] See Dr. Good's Study of Medicine, vol. ii., p. 550., and vol. iii., p. 69. ed. 2. 8vo. Lond. 1825.

[†] Hunter on the blood, &c. p. 270.

To some cases of this description, the name of *diffuse inflammation in the cellular membrane* has been lately applied: it having appeared to several judicious observers †, that the examples in question should not be regarded as erysipelas. The two diseases, says Dr. Scott, with which this diffuse inflammation of the cellular membrane is most likely to be confounded, after the disease is fully formed, are erysipelas and typhus fever. From the first it is distinguished in all the pure cases, by some evident cause of irritation having been previously applied ‡, by the absence of inflammation of the skin; by the swelling having a peculiar elastic or *boggy* feel; by the disease concentrating itself in the axilla of the affected limb and surrounding parts; and by its universal termination in suppuration. From typhus fever, he says, it is distinguished by the febrile affection being symptomatic of a previously existing local action, by the fever corresponding in intensity to the intensity of the local affection; by the brain being much less implicated, excepting where the disorder arises from dissection (erythema anatomicum §); by its history; and by its non-contagious character.

Erysipelas, in the sense of an idiopathic fever, giving rise to an erythema, or efflorescence as a symptom, comes on with various degrees of severity. In its mildest form, it is preceded by no particular complaints, or merely by a very slight indisposition, languor, restlessness, loss of appetite, &c. These symptoms are of short duration, and abate as soon as the erythema appears, which increases for a couple of days, then remains unchanged about a similar space of time, and afterwards turns yellowish, and gradually fades away, the cuticle at the same time peeling off. During the whole course of the disorder, the fever is slight, the pulse being sometimes only a little disturbed previously to the appearance of the redness.

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* See Hunter on the blood, &c. p. 272.

† Dr. Duncan jun., in Edinb. Med. Chir. Trans. vol. i. Dr. David Scott, in Edinb. Med. and Surg. Journ. No. 85.

‡ This circumstance does not distinguish it from erysipelas in general, according to the common acceptation of the word, but only from the idiopathic fever, of which the erysipelatous inflammation of some part of the surface of the body, is a mere symptom. Many other cases are excited by various forms of irritation.

§ So named by Dr. Good (Study of Medicine, vol. ii. p. 363.) who describes, as one of its characters, a deep crimson blush, chiefly over the pectoral muscle, which account corresponds with what I have seen. Instead, therefore, of representing *non-inflammation of the skin* as a distinguishing feature, I conceive that it would be more correct to say, that the skin is less widely inflamed, than in common erysipelas; and does not so soon exhibit discoloration.

In a more severe degree of the disorder, the patient experiences, for a couple of days before the erysipelas breaks out, unusual debility, heaviness in the limbs, headach, loss of appetite, nausea, actual vomiting, oppression about the stomach, &c. After two days (generally on the third) the erythema appears, attended with a gentle perspiration, and an increase in the secretion of urine, when the fever, and all the other complaints subside. The disease then follows the same course as the first case already described.

In the third and most violent degree of erysipelas, which mostly attacks the face, the patient is affected with severe fever, headach, lethargic drowsiness, a symptom generally very strongly marked, shiverings, vomiting, delirium, &c. These symptoms do not, as in the foregoing examples, subside upon the breaking out of the erythema on the third day; but continue with undiminished vehemence, until the local disorder itself goes off, which usually happens about the eleventh day, attended with copious evacuations from the skin and kidnies.*

The vesications generally form on the inflamed parts about the third, fourth, or fifth day; and contain a thin irritating fluid, under which the skin generally heals, but sometimes ulcerates. They gradually burst when scabs are produced.

The causes of erysipelas, in the sense of a fever, characterized by this peculiar inflammation of the skin, are as obscure as those of most other fevers, the origin of which cannot be fairly imputed to contagion, or epidemic circumstances. Why an inflammation of the skin, also unpreceded by such fever, should assume the erysipelatous character, is what cannot always be explained. A deranged state of the bilious secretion, disorder of the digestive organs in general, sudden stoppage of perspiration by cold, and a peculiar condition of the system, induced by these or other circumstances, are all conditions which have been repeatedly suspected as having a great share in determining the character of this inflammation. That there is a great and intimate sympathy between the alimentary canal and the skin, seems, indeed, to be proved by the effects of certain kinds of food in bringing out eruptions, resembling urticaria and roseola †; but I am not aware, that the origin of erysipelas from this cause has ever been clearly proved. It is evident, also, that without some idiosyncrasy, which cannot be defined, none of the foregoing exciting causes would produce erysipelatous inflammation, as it is not in every person, or even the generality of individuals, that such a consequence ensues. The same may be said of every species of external irritation. A suspicion has been entertained, that erysipelas is sometimes propagated by contagion *; but, whether the commencement and extension of the disorder amongst patients in certain hospitals, as has been sometimes noticed, might not be better accounted for by the operation of epidemic causes, is a point not altogether decided.

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* See Richter's Anfangsgr. der Wundarzneykunst, b. 1. p. 98, 99.

† Unwashed muscles. Montegre, in Gazette de Santé, Mars 1812. Burrows, in Lond. Med. Repository, vol. iii. p. 445., Orfila, Toxicologie Générale, t. 2. Rice. Lassus, Pathol. Chir. t. 1. p. 10.

That erysipelas generally depends upon some particular state of the constitution cannot be doubted; and this may account for the greater efficacy of internal remedies, than of topical applications. Persons, who lead intemperate lives, and who, in a state of intoxication, meet with local injuries, often have erysipelatous inflammation; while other subjects, of more regular habits, when they receive similar injuries, experience healthy inflammation. At the same time it must be acknowledged, that erysipelas sometimes arises in constitutions, with which we can find no manifest fault; and females and children, leading perfectly regular lives, are frequently attacked. The obscurity of this topic has not hitherto been removed by pathologists; and even the doctrine of constitutional causes seems to be shaken by the well-known fact, that it is the common course of the disease to be actually getting well on one side, as fast as it is spreading on another. Perhaps, here, the only mode of reconciling things is to suppose, that parts, which have been affected, lose for a time their susceptibility of the complaint.

Erysipelas may be attended with inflammatory, or typhus fever. In the first case, which is often named *phlegmonous*, or *acute erysipelas*, the external inflammation is redder, more prominent, and indurated than usual; the pain shooting and throbbing; the pulse full and hard; and the fever ardent. In the second case, which is sometimes called *malignant*, or *gangrenous erysipelas*, and seems to me to include also the disorder named by some modern writers, *diffuse inflammation in the cellular membrane*, the patient is much debilitated, the redness is lead-coloured, dusky, or bluish, and the fever plainly typhoid.

Most writers describe vesications as one of the essential characters of erysipelas; but this statement is only correct, as applied to the affection of the skin in the idiopathic exanthematous fever, called erysipelas; for many cases which surgeons have to deal with, and which are mostly connected with local irritation, wounds, &c. are not attended with any vesications.†

The *habitual* or *chronic* erysipelas, often arises as an idiopathic disease, and always in the same place. It is very tedious; but is not generally attended with much fever, or other serious symptoms. Sometimes the disorder is *periodical*, recurring in the same person regularly at certain seasons of the year, especially in the spring and

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[*] Wells, in Trans. of a Society for the Improvement of Med. and Chirurg. Knowledge, vol. ii. art. 17.

[†] See also Pearson's Principles of Surgery, p. 198. edit. 2.

autumn. It principally affects persons of advanced age, or women about the period of life when the menses cease.*

The *œdematous erysipelas* is another variety which must not be forgotten. Its attack is not so sudden as that of the phlegmonous and bilious erysipelas; nor is the disease at first so severe. It increases gradually, and is attended with a greater degree of swelling, which is more diffused. The pain is less severe. The fever is accompanied with prostration of strength, and a soft, frequent, and sometimes irregular pulse. The system is not relieved on the appearance of the local affection; on the contrary, the danger increases with the progress of the external disease. The part affected is of a pale red, or yellowish brown colour, and if pressed with the finger, a slight pit remains for a little while. When the face is attacked, it has a bloated appearance; the features can scarcely be discerned; and the eyes are concealed by the swelling of the eyelids. The vesications are smaller and more numerous than in the acute erysipelas, and, after a few days, change to dark-coloured scabs, much resembling those of the confluent small-pox. The disease, when situated about the head, is accompanied with rigors, vomiting, and often with coma and delirium; frequently proving fatal about the seventh day, or a little later.† It never occurs except in bad constitutions, and subjects guilty of excesses in their mode of living.

With regard to the *prognosis*, cases of idiopathic erysipelas, when properly treated, are generally cured about the eleventh day. Considerable danger may arise, however, when external parts of importance are affected; when the disease shifts its situation, and internal organs, such as the brain and lungs, are disordered; or when the case terminates in suppuration and gangrene, either from bad treatment, peculiarity of constitution, or epidemic causes.‡ Erysipelas of the face, cæteris paribus, is more dangerous than that of any other external situation.§ The coming on of delirium and coma, subsequently to the eruption, is a threatening circumstance. The *malignant* or *gangrenous erysipelas*, attended with low typhus fever, and the forms of disease named *diffuse inflammation* in the cellular membrane, are always dangerous; and so is the *œdematous erysipelas*, when it occurs as an idiopathic disease, is situated on the head and face ||, and accompanied with disturbance of the intellectual faculties.

Mild cases of the idiopathic fever, characterised by erysipelas, are in general soon relieved by the exhibition of saline, purging, and

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* Lassus, Pathologie Chir. t.i. p. 9. Richter, Op. cit. p. 102. Pearson, p. 200. Callisen says: "Habituale erysipelas ex infarctu hepatis ortum ducere solet," t. i. p. 219.

† See Pearson's Principles of Surgery, edit. 2. p. 201, 202.

‡ Callisen, Syst. Chirurgiæ Hodiernæ, t. i. p. 220.

§ Callisen, Op. et loco citato. Richter, Anfangsgr. &c. b. i. p.103.

|| See Bateman's Practical Synopsis of Cutaneous Diseases, p. 128. edit. 5. Pearson's Principles of Surgery, p. 202. edit. 2.

sudorific medicines. Here, however, only such diaphoretics are allowable as operate without stimulating; like the potassæ nitras joined with small quantities of antimonial powder, or the liquor antim. tart. The patient is to be kept in a warmish, but well-ventilated apartment, and strictly upon the antiphlogistic regimen.

In a more severe form of the complaint, in addition to these remedies, venesection is sometimes useful, especially when the pulse is full, and the face is the part attacked. There is an ancient doctrine, that erysipelas is essentially connected with debility; and hence has arisen a common aversion to bleeding as a means of relief; but the experience of Dr. Duncan, and some other modern practitioners, tends to prove, that the practice may be adopted with as much success in cases of erysipelas, as in those of other kinds of inflammation. The nature of the fever, however, should be considered, as a typhoid state of the system will not admit of loss of blood.

When the tongue is foul, with a bitter taste in the mouth, and inclination to sickness; or when the signs of visceral disorder, and the febrile symptoms, yield little, or not at all, to purgatives; and the alvine evacuations have not a very bad smell and appearance; an emetic should be given. Sometimes, during the use of purgatives, the disorder abates for a little while, and then becomes stationary and tedious; here an emetic generally does immense good. When, notwithstanding the administration of gentle purgatives, the gastric complaints repeatedly return, diluted sulphuric acid may often be exhibited with decided benefit.*

In the treatment of erysipelas, joined with bilious disorder, Desault used to administer, in the first instance, a grain of antimonium tartarizatum, dissolved in a liberal quantity of water. The symptoms are said to have frequently subsided immediately after the effect of this medicine, even though a mere increase of perspiration and urine was occasioned by it. When the case proved more obstinate, the emetic beverage was continued, till the febrile disorder and bitterness in the mouth were removed. The cure was then completed, with a dose, or two, of the mildest purgatives. After a few days, the patient was not restricted to a very low regimen.†

Bark has been almost as extensively recommended for erysipelas as for mortification. When great weakness prevails, the appetite is bad, and evacuations have been duly practised, it is, indeed, a medicine which may often be given with advantage, especially the new preparation of it, called the sulphate of quinine. It is also frequently proper, when the disorder, besides being attended with these symptoms, is combined with suppuration, gangrenous mischief, and a profuse discharge. In the *gangrenous erysipelas*, which sometimes afflicts new-born infants, and with which, indeed, they appear to be actually born*, bark is said to be an indispensable remedy.† Bark, however, is no more a specific for erysipelas in general, than it is for mortification. In the *acute* or *phlegmonous* form of the disorder, both this medicine and opium are now considered quite unnecessary‡; but in *erysipelas œdematodes* and *erraticum*, they may be exhibited after the first three or four days, during which evacuations are the chief means of relief. The diet and regimen must conform to the rest of the treatment; being generally at first low and antiphlogistic, and afterwards of a cordial and strengthening kind. When delirium prevails, camphor may be administered, and a blister applied between the shoulders, or rather to the head itself, unless it happen to be the seat of the erysipelas.

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* Richter, Anfangsgr. &c. b. i. p. 105, 106.

† Œuvres Chir. de Desault, par Bichat, tom. ii. p. 588.

Blisters have been extensively employed in the treatment of erysipelas, especially where the disorder appeared to have undergone a *metastasis* to internal organs. Here, they were of course laid upon the part originally affected, with the view of bringing back the erysipelas to it. This is a practice which is yet not altogether discontinued, many practitioners having full faith in the principles upon which it is founded. Sometimes, in obstinate cases of erysipelas erraticum, affecting only the surface of the body, blisters were laid upon distant parts, with a view of relieving the disorder in the parts actually suffering. Dupuytren sometimes attacks the erysipelas erraticum with blisters; but in a very different way, for he lays them directly upon the erysipelatous part, thus following up the disorder in every situation to which it may remove; and Delpech has frequently seen suppuration, gangrene, &c. prevented in other forms of the complaint, by repeatedly blistering the part affected. According to Professor Gibson, also, blisters are very efficacious.§ Nay, Dupuytren sometimes applies the actual cautery to it, as is alleged, with the greatest benefit.|| In the cases which have been described by Drs. Duncan and Scott, under the name of diffuse inflammation of the cellular membrane, blisters, and even the application of caustic, have been of great service, as I shall presently have occasion to explain.

According to some surgeons, external applications frequently do harm, and are never of much service; and every thing wet, whether warm or cold, emollient, repellent or astringent, is generally disapproved of.¶ With respect to the dry, mealy, or earthy powders, which were preferred by Cullen, we have good authority for pronouncing them always useless, and often injurious, since they are

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* Sometimes called, therefore, *congenital.*

† See Underwood's Treatise on the Diseases of Children, vol. ii. p. 31. edit. 5. Garthshore and Bromfield's Obs. in Med. Communications, vol. ii. Callisen's Systema Chirurgiæ Hodiernæ, vol. i. p. 223.

‡ See Bateman's Practical Synopsis of Cutaneous Diseases, p. 132. edit. 3.

§ Institutes of Surgery, vol. i. p. 45. 8vo. Philadelphia, 1824.

|| Précis des Mal. Chir. t. i. p. 54.

¶ Richter, op. cit. b. 1. p. 106. Callisen, Systema Chirurgiæ Hod. vol. i. p. 221.

apt to form, with the fluid which exudes from the vesications, hard, irritating crusts. Indeed, very disagreeable and dangerous consequences have ensued from their use.* Unctuous substances are generally condemned; but, in America, mercurial ointment, made up without any stimulating ingredients, has been found the best of all local applications.† Some modern authors‡ sanction covering the part with little bags, filled with aromatic herbs, to which camphor is added in a more advanced stage of the disorder. Others prefer rubefacients, and mild, warm cataplasms, composed of the powders of aniseed, fennel, camomile-flowers, mixed with oatmeal, or linseed meal, and a strong decoction of poppy-heads.§

When there are vesications, they should be punctured with a needle, and the fluid absorbed with a fine sponge.||

When the fever and local redness have mostly or entirely gone, and merely a pale œdematous swelling remains, camphorated or ammoniacal liniments¶, and the use of a bandage, will remove the remains of the disease; or the part may be covered with a piece of green oil-skin.** On the same authority, we may, when the pain and burning are violent, lay on the part a piece of flannel, wet with warm milk, or a decoction of elder or camomile-flowers, or poppy-heads; a kind of practice which is also recommended by another eminent writer††, as the best means of preventing any ill consequences from the acrid discharge of the broken vesications.

Both in the *phlegmonous* and *bilious* erysipelas, arising from internal causes, Desault made use of no topical applications, and left the part exposed as much as possible to the air. But, when the erysipelas, whether phlegmonous or bilious, was the consequence of a contusion, wound, or ulcer, he deemed regimen and internal means insufficient, unless assisted by such applications as were best calculated to allay local irritation, and promote suppuration in the sore or wound. With these principles, he employed poultices, the beneficial effects of which are said to have been fully confirmed in his extensive practice. He considered it an essential precaution, however, not to let the poultice extend much beyond the contused place, or the margin of the wound, or ulcer; and over the rest of the erysipelatous surface, if he applied any thing, it was the liquor plumbi acetatis dilutus, ʒj to a pint of water. Even refrigerants may be safely applied to erysipelas arising from external causes.‡‡

As for the local treatment of the idiopathic forms of the disorder, I confess, that I entertain no opinion of the real merit either of rubefacients or stimulating poultices; and join Richter, Willan, and Bateman in giving a preference, when the redness and heat are very

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* Pearson's Principles of Surgery, p. 218. edit. 2. Callisen, op. et loco cit. Bateman, op. cit. p. 133. Richerand, t. i. p. ccvii. edit. 4.

† See Gibson's Institutes of Surgery, vol. 1. p. 45. 8vo. Philadelphia, 1824.

‡ Richter, Callisen, &c.

§ Pearson, p. 219.

|| Richter, b. 1. p. 107.

¶ Pearson, p. 219.

** Richter, p. 107.

†† Willan.

‡‡ Richerand, Nosogr. Chir. t. i. p. ccvii. edit. 4.

great, to fomentations and tepid bathing, or else to a lotion consisting of the diluted liquor ammoniæ acetatis.*

In the phlegmonous erysipelas, attended with risk of gangrene, the making of several incisions in the part is said to have averted this unpleasant consequence.† But, when suppuration and gangrene have occurred, the treatment must be regulated by the principles laid down in the foregoing chapters. In particular, early and free incisions are here absolutely necessary, in order to prevent the extension of the mischief under the skin, and to enable the surgeon to draw out the sloughs of tendons, fasciæ, cellular membrane, &c. as soon as they are completely loose.

I shall conclude this chapter, with a summary of the treatment that has been found to answer best in the cases described by modern writers, under the name of *diffuse inflammation of the cellular membrane.* When the complaint arose from irritation, the patients possessed moderate strength, and only the extremity was affected; the means used, were generally blood-letting in the beginning, sometimes repeated; leeches; cold applications; and a purgative of Epsom salts and tartarized antimony. When the disorder had reached the arm-pit, the depleting system was relinquished, and hot fomentations and poultices applied. When the complaint had much tendency to spread, blisters and caustic potassa were applied, with the view of exciting inflammation in the skin, so as to limit the diffusive character of the disease, by producing an effusion of coagulable lymph. Then poultices were used again, and the parts opened, as soon as possible, with a lancet, even although matter had not yet been formed, as the effusion of even serum was serviceable

When there was great irritability, tincture of opium, joined with antimonial or ipecacuanha wine, was administered, with a cooling but nutritious diet. When suppuration had taken place, the antimonials were discontinued, and wine and porter allowed. In the cases arising from dissection, every thing that tends to maintain a vigorous circulation of the blood, is found most successful.‡

CHAP. VII.

OF THE FURUNCULUS, OR BOIL.

THE boil is a circumscribed, very prominent, hard, dark-red, painful, inflammatory swelling, of a conical shape, having its base below the skin, and its apex above it. The color of it is a dusky-red, inclining to purple, and on its summit is a whitish little eschar, under which is a mass of destroyed cellular membrane, called a *core*. A boil is seldom larger than a pigeon's egg, and for the most part single; but sometimes a great number of similar tumors show themselves at once in different parts of the body, or come out in succession, more particularly in children, or just after the termination of an acute disease.* Boils are rarely attended with fever, except when they affect very tender parts, or are large and numerous. Under these circumstances, they sometimes cause in delicate children, restlessness, loss of appetite, and even convulsions, &c. In certain instances, as Heister remarks, the whole body is so miserably infested with them, that the patient can hardly tell how to stir, or on what part to lie.† The particular form of inflammation attending boils, and which Scarpa observes might be called *furuncular*, differs in several respects from common phlegmonous inflammation. The former commences in the skin, extends itself downwards into the subjacent cellular membrane, and produces a more or less extensive destruction of it. Phlegmonous inflammation, on the other hand, originates in the cellular membrane, the vitality of which it does not destroy, and is afterwards propagated externally to the skin. The furuncular inflammation is quickly arrested, and forms a small, circumscribed, hard, and very painful tumor, which, though elevated upon the skin, does not contain extravasated coagulable lymph, but consists entirely of mortified or disorganized cellular membrane; while, on the contrary, phlegmonous inflammation is disposed to spread far through the cellular membrane, into the cells of which a considerable quantity of coagulable lymph is incessantly poured, occasioning the tumefaction. In consequence of the furunculus being completely filled with mortified or disorganized cellular membrane, suppuration in it is very imperfect, and never takes place in the centre of the tumor, but only at its circumference, where it is in contact with the sound parts; while, in phlegmon, a true and complete suppuration is formed precisely in the centre of the inflamed part, which, after the discharge of the matter, spontaneously recovers its natural state and functions. In the second stage of the furunculus, the skin, which covers it, ulcerates and bursts at one or more points, and discharges a very small quantity of serous fluid; and the portion of mortified cellular membrane, which composes the body and base of the tumor, then comes away in the form of an extraneous substance, and the cavity which remains, closes and soon heals.‡

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* Practical Synopsis of Cutaneous Diseases, p. 134. edit. 5.

† A. C. Hutchison in Medico. Chir. Trans. vol. v. p. 278, &c.

‡ See Dr. D. Scott's Obs. in Edinb. Med. Journ. No. 85.

Boils mostly arise from a particular state of the constitution, and depend upon internal causes. Hence, the complaint is most frequent in the spring-months, and in children, and young persons, of full plethoric habits. It is also very often noticed in that state of the system, which immediately follows the recovery from certain febrile diseases, the measles, small-pox, &c. The common circumstance of many boils being formed either simultaneously, or in succession, in the same patient, is another fact tending to prove the agency of internal causes, of which, if there were yet any doubt, it would be dispelled by the consideration, that in some instances, evident marks of constitutional indisposition, for two or three days, precede the local disease. Boils of the latter description were thought by the old surgeons to be critical. Boils, which form in children at the breast, are alleged to proceed very frequently from the bad quality of the milk; and, the instances, in which they are numerous, and disposed to return, are said often to be caused by a disordered state of the digestive organs. I know nothing of the accuracy of the common notion, that a boil commences in one of the small glands of the skin. *

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* Pearson's Principles of Surgery, p. 72. edit. 2.

† General System of Surgery, p. 213. edit. 6.

‡ Scarpa on the Principal Diseases of the Eyes. p. 58. transl. by Briggs, edit. 2.

As every attempt to resolve swellings of this kind by bleeding, evacuations, and discutient applications, mostly fails, and the longer it is continued the more protracted the disease is, the best general practice is to promote suppuration. It seems, indeed, to be the nature of a boil not only to suppurate, but to destroy a portion of the cellular membrane; and in a few rare examples, in which the surgeon by means of particular applications, succeeds in bringing about resolution, it is very incomplete, the inflammation alone being removed, and an induration left, which produces more or less inconvenience, from time to time inflames again, and is never totally dispersed, until a free suppuration is excited. †

In all ordinary cases, emollient poultices are the right applications, to which, if the pain be very severe, some of the extractum conii, hyoscyami, vel opii, may be added. In some excellent works on surgery, we are directed to continue the use of poultices, until the tumor spontaneously bursts. But, as the generality of boils are slow in breaking, and the patient never gets relief, until the matter is discharged, the most judicious practice is to make an early and rather a free opening with a lancet. The contents should then be gently pressed out, and every portion of the gangrenous cellular membrane, nucleus, or core, extracted, if it can be done without giving too much pain. When boils are left to burst of themselves, the duration of the disease is generally considerably longer, than when they are opened; and chiefly for two reasons: first, as already observed, because the spontaneous aperture is slow in forming; and, secondly, because when formed, it is not large enough for the ready evacuation of the sloughs, and flakes of dead cellular membrane, contained in the swelling. The presence of the mortified cellular membrane is now known to be one of the principal impediments to cicatrization, and the wisest practice must therefore be, to make such an opening, as will facilitate as much as possible the discharge, or removal of that noxious substance. When this has been done, the employment of emollient poultices, and simple dress-

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* Richter, Callisen, &c.

† Richter's Ansfangsgr. der Wundarzn. b. 1. p. 133. Also Scarpa, op. cit. p. 60.

ings, a few days longer, will generally complete the cure. Many surgical writers recommend the application of escharotics, and particularly the pulv. hydrargyri nitrico-oxydi, with a view of promoting the separation of the slough, and dispersing the remaining hardness. This, however, is a painful practice, which is no more necessary here, than it is in other abscesses, the hardness around which always subsides in proportion as the inflammation abates; and, with respect to the portion of gangrenous cellular membrane, it will not in general be considerable, nor its detention in the part long, if the surgeon follow the above rule of making a proper and an early opening. Boils always present a very prominent, conical apex, while their base is comparatively speaking broad. * The knowledge of this fact must at once convince us of the insufficiency of a small aperture, whether formed by art, or nature.

In severe and obstinate cases, internal remedies, adapted to the particular complications of the disease, are not to be omitted, such as bleeding, aperient medicines, emetics, and a proper regimen. Where several boils occur in a patient advanced in years, bark is said to prove useful; and in children at the breast, the mother, or nurse, should take some purging medicine, and be put on a strict regimen. The infants should also take small doses of antimony with an absorbent powder. † If these plans fail, the milk must be changed. ‡ The disposition to boils may sometimes be removed by the use of bark, sea-bathing, acids, steel-medicines §, and mineral waters. || When boils are very large, and attended with severe pain, opium should be adminstered.

CHAP. VIII.

OF THE ANTHRAX, OR CARBUNCLE.

A CARBUNCLE is an inflammatory, broad, flat, firm, distinctly circumscribed, very painful swelling, of a dark-red or dull-brown colour, somewhat resembling a boil, but larger, and, like it, containing a portion of gangrenous cellular membrane. It begins in the skin, almost like a pimple, and goes more and more deeply, spreading with a broad base in the subcutaneous cellular membrane.¶ It is certainly more like an aggravated description of boil, than any other tumor with which it can be compared, though it differs not only in being larger, but also in not presenting so conical a protu-

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* See Pearson's Principles of Surgery, p. 70. edit. 2.

† Heister, General System of Surgery, p. 214.

‡ See Callisen's Syst. Chir. Hodiernæ, vol. i. p. 328.

§ Pearson, p. 76.

|| Heister, p. 215.

¶ Hunter on the Blood, &c. Part II. Chap. iv.

berance; the chief part of the swelling lying deep, and none of it being much elevated above the level of the skin. While boils seldom exceed a pigeon's egg in size, a carbuncle is sometimes as broad as a common dinner-plate, as I once saw an instance of in a poor woman, who was in 1808 a patient in St. Bartholomew's Hospital. This magnitude, however, is only seen in very severe cases, and the average diameter of the tumor, though greater than that of boils, will admit of no such comparison. Sometimes the superincumbent skin, besides being discoloured in the manner above described, becomes so remarkably hardened and thickened, that it feels like brawn. The disease in fact is always attended with extraordinary pain and induration, and the patient is generally much afflicted with a sensation of burning, and stiffness in the part. The dark-red or dull-brown colour of the skin is for the most part chiefly seen upon the centre of the swelling, though, in some instances, the pain and discolouration extend far around. As the disease advances, one or more livid or darkish vesicles, filled with an irritating sanies, form upon its surface; a certain mark of the subjacent gangrenous mischief. On the apex of the swelling, a dark livid spot, bounded by an inflammatory circle, next makes its appearance, followed by the formation of one or several small inadequate apertures, through which a yellow, greenish, bloody, highly fetid discharge flows out, while the great mass of matter, and sloughy cellular membrane still remains confined. As in the boil, the greatest degree of sloughing in all carbuncles is at their deepest part, or base, which occupies a much wider space than the more superficial portion of the tumor. In many cases, indeed, the deeply-seated gangrene is extensive, even when the unaltered state of the superincumbent integuments causes little suspicion of the mischief. By slow degrees, all the sloughs composing as it were the nucleus of the carbuncle, are discharged, leaving a deep ulcer, at the bottom of which one may sometimes see the exposed muscles and tendons.

Carbuncles seem mostly to arise from internal causes, being most common in persons who have lived well, and rare in subjects under the middle age*; a point, in which this disease particularly differs from boils. Great prostration of strength, violent headachs, sickness, loathing of food, and a variety of low febrile symptoms, are the common forerunners and companions of the local disorder, and, in bad cases, syncope, extreme anxiety, restlessness, and delirium. The anthrax is well known to be among the symptoms of the plague, and, in this country, it is often attended with severe illness, not unlike the worst sort of typhus fever.

The milder forms of anthrax, where the swelling is not very large, nor the general indisposition at all dangerous, sometimes receive the appellation of *simple* or *benign*. When circumstances are the reverse of this state, and, more especially, when the fever is of bad type, the carbuncle is termed *malignant*. In this case, the swelling exhibits a darker colour, and the surrounding œdema of the skin is more considerable. The carbuncle of the plague is called *symptomatic* or *pestilential*. To these varieties we have lastly to add another, which is endemial in some of the southern provinces of France, which does not arise, like all the preceding, from internal causes, but from the application of a specific contagion, resembling, on its first attack, a flea-bite, but afterwards putting on an alarming character, and being well known on the continent under the name of the *malignant pustule*.* While other kinds of carbuncle may present themselves to the number of two, three, or more, in the same patient, the malignant pustule is almost invariably single. In all other cases, some fever or indisposition always precedes the tumor; but, in the malignant pustule, the local disease at first exists by itself, and the low, febrile, typhoid symptoms follow. On its first appearance, it resembles a flea-bite, causing a painful itching, and changing into a small serous vesicle, which is about as large as a millet seed, and quickly turns livid or brownish. In the substance of the integuments, a circumscribed flat tubercle is next perceived, of the size of a lentil; this becomes gangrenous, and is converted into a hard black slough, which is bounded by a reddish, shining, violet, vesicular areola. Considerable swelling follows, and the skin has a glossy appearance. If the pustule be on the finger or hand, the swelling reaches high up the arm, even to the arm-pit; and, if the disease be in the neck or face, the tumefaction spreads over the shoulder. The progress is sometimes alarmingly rapid, the pulse is weak and faltering, and the utmost prostration of strength observable; the patient often dying in the course of two or three days, and the body putrefying with extraordinary rapidity.

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* Hunter on the Blood, &c. Chap. iv.

That common carbuncles originate, or, at least, are essentially connected with an idiosyncrasy, or some peculiar state of the general health, is a fact, of which no doubt can be entertained; but, in what that peculiarity consists, medical writers have not yet been able to specify. The disease is seldom met with in hospitals, because the individuals, in whom it presents itself, are generally persons, whose constitutions have been impaired by excesses at table. It is also seldom noticed in persons below the middle age; but mostly in elderly, debilitated subjects. The cause of the pestilential carbuncle, as its name implies, is the plague. The malignant pustule, if the accounts of its origin be correct, is a very singular and peculiar disease; for, instead of proceeding from internal causes, like all other carbuncles, it arises from a contagion derived from animals affected with malignant fever, or carbuncular diseases. The infection is represented as being communicated to the human subject by contact, respiration, deglutition, or the bites of insects.

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* See Methode de traiter les Morsures des Animaux Enragés, &c. suivie d'un Précis sur la Pustule Maligne, par MM. Enaux et Chaussier. Dijon, 1785.

Slaughtermen, tanners, fellmongers, tallow-melters, and other workmen whose business it is to clean and comb out wool, are said to be particularly liable to the disease. Notwithstanding the multiplicity of authorities in support of this account, some doubts may be rationally entertained respecting its accuracy, when it is remembered that the alleged causes exist in this country, yet we have no disease which exactly corresponds to the malignant pustule. The French writers also specify want, poverty, uncleanliness, marshy situations, and the autumnal season, as predisposing causes. Were all these circumstances, however, of themselves adequate to the production of the disease, it would certainly be seen, in some parts of this kingdom. There must, therefore, be other things which contribute to its production, and render it endemial in the southern provinces of France.

In all cases of carbuncle, the prognosis depends very much on the size and situation of the swelling; on the number of such tumors; and, above all, on the state of the constitution. If, together with a carbuncle of considerable magnitude, we remark great prostration of strength, a small, rapid, irregular pulse, syncope, frequent vomiting, delirium, &c. the danger is urgent.

When, in the beginning of the disease, a good deal of inflammatory fever prevails, moderate venesection, mild saline or calomel purges, and the antiphlogistic regimen, are indicated. But, as the change from strength to weakness is often extremely sudden, the lancet should be employed with caution, and few patients will bear the loss of much blood with advantage. Indeed, the antiphlogistic plan can seldom be continued beyond the first two or three days, after which the typhoid state of the constitution comes on, and tonics are strongly indicated.

Where there is reason to suppose the origin of a carbuncle to be connected with disorder of the digestive organs, nothing is more useful, prior to the accession of much debility, than the exhibition of an emetic followed by aperient medicines *, such as a few doses of the hydrargyri submurias, or some cooling febrifuge drink, containing a sufficient quantity of the antimonium tartarizatum to keep the bowels well open. In this case, however, as in all other examples of anthrax, so great is the tendency to sudden prostration of strength, and typhoid symptoms, that a tonic plan must immediately follow the means here recommended. In particular, bark, the sulphate of quinine, sulphuric ether, and light nutritious food, are the remedies which produce most benefit.

As the pain of carbuncles is severe, opium is another remedy which can seldom be dispensed with; and it is frequently a good plan to prescribe it in repeated doses, so as to keep the patient under its influence.

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* See Richter's Ansfangsgr. der Wundarzn. b. 1. p. 138. Lassus, Pathologie Chir. t. i. p. 41.

In very bad cases, attended with delirium, the head should be shaved and blistered, and, with the other medicines, camphor should be combined.

On the necessity of letting the patient enjoy the benefit of plenty of fresh air, in every instance of a typhoid kind, it is scarcely requisite to insist: it is a measure fully as important as the choice of medicines, and in some respects more so, as without it all the articles of the materia medica will be ineffectual.

In the local treatment, the surgeon should be impressed with the inutility of endeavouring to resolve a carbuncle by any cold or astringent applications, a method, which (to say the best of it) is only loss of time. The most judicious practice is always to have recourse at once to emollient poultices and fomentations.

The openings which form in the tumor are sometimes numerous, but so small that the matter and sloughs cannot readily escape. As they are likewise slow in forming, as well as inadequate to give a free outlet to the contents of the tumor, the best practice is to make an early and free incision. The surgeon should then press out as much of the matter and gangrenous cellular membrane as he can, without causing too much pain. An emollient poultice is now to be applied; the rest of the sloughs gradually loosen; the discharge improves in quality; the surrounding induration diminishes; the ulcer becomes cleaner and granulates; and the cavity is at length filled up and healed. In other less fortunate examples, however, the patient's constitution sinks; no healthy changes occur; and death soon follows.

The ancients * made it a rule to apply the actual cautery to carbuncles in general; and this method is still pursued in France. Our brethren abroad adopt the old notion, that the heated iron stops the progress of the gangrene, and produces a salutary irritation, which invigorates the debilitated parts. They also occasionally employ the strongest caustics, such as the muriate of antimony; sulphuric acid; the muriatic acid, &c. A bit of charpie is dipped in them, and laid upon the centre of the swelling; or a small puncture is first made, and the caustic liquid then introduced with a pointed piece of wood.

In America, the treatment with caustic also has advocates. "When openings form, and discharge a bloody serum (says Professor Gibson), the poultice should be laid aside, and the surface of the tumor, as far as the openings extend, covered freely with the caustic vegetable alkali. The caustic gives some pain, but this soon subsides, and the severe burning pain, peculiar to the disease, is from that time entirely removed. Dr. Physick, to whom we are chiefly indebted for our knowledge of the proper application of this remedy, states, that in all the cases, in which he has used the caustic in this manner, the suffering of the patient ceased as soon as the pain from the caustic subsided. It should be recollected

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* A. Corn. Celsus, lib. 5. cap. 28.

then, that the caustic will prove hurtful in the commencement of carbuncle, but extremely beneficial in the second stage, or that period when openings form in the tumor. From inattention to these circumstances, (continues Professor Gibson) there is reason to believe much mischief has resulted, — from deep ill-timed incisions, from the actual cautery, and from caustics."

Blisters have been greatly praised for their good effects in carbuncular diseases *; but the latter writer, who has made trial of them, only admits that they are useful in lessening the pain. †

CHAP. IX.

ŒDEMA.

Œdema is a preternatural accumulation of an aqueous fluid in the interstices of the cellular substance of a part. It is the same sort of disease, as anasarca, only less both in degree and extent.

The tumor is uncircumscribed. The skin of the swollen part retains its natural colour: if at all changed it is rather paler. The part has a cold feel, and the pressure of the finger occasions an impression, or *pitting*, which remains some time, and slowly disappears There is no acute pain; but an uneasiness, or sense of weight, and tightness. When the œdematous limb is in a depending posture, the magnitude of the tumor is increased; *et vice versâ.*

In a few rare cases, the tumor is quite circumscribed, and of remarkably small extent: Mr. Pott mentions his having seen an affection of this kind, entirely confined to one side of the skin of the scrotum. This is to be wondered at, as the fluid is situated in the common cellular substance.

Sometimes, œdema is conjoined with erysipelatous, or phlegmonous inflammation; the case which Mr. Hunter called *œdematous inflammation*, and which is attended with an extravasation of water, and the appearance of common inflammation, the skin having a scarlet colour, which, however, is more diffused. The effused fluid being principally serum, the swelling is even more diffused than the inflammation itself. The part affected is very painful; but is not attended with much of the throbbing sensation which accompanies common phlegmonous inflammation. The affection seems only superficial, though it probably extends to some depth. According to Hunter, the difference between this and common inflammation, arises from the principle of inflammation acting upon a dropsical disposition, which is always weak. A stronger constitution would have produced the adhesive stage of inflammation, from the same cause. He adopted this belief, on account of the common occurrence of exactly this kind of inflammation, from distention in many cases of anasarcous legs. Œdematous inflammation is more lasting than common inflammation, and seldom suppurates. Should it do so, the cellular substance, in the interstices of parts, is apt to slough, and extensive, uncircumscribed abscesses to occur. *

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* Dorsey's Elements, vol. i. p. 25.

† Institutes, &c. vol. i. p. 51.

Œdema may depend on constitutional or on local debility. Contusions, sprains, the long-continued use of splints, bandages, relaxing poultices, and washes, are often local causes of œdema. A part which has undergone acute inflammation, often remains œdematous for some time afterwards. In all these instances, the tone of the vessels being impaired, is the cause of the disease. The complaint is very often owing to some impediment, preventing the return of blood towards the heart. The pressure of the gravid uterus on the iliac veins, often renders the lower extremities œdematous. Aneurisms frequently compress the chief veins of an extremity and bring on this affection. Œdema must in many instances be a mere symptom of other diseases, which operate as a cause. It accompanies ascites, hydrothorax, deeply-seated abscesses, &c. &c.

The particular cause of œdema, whatever it may be, must be removed, ere a cure can be effected. When this important indication has been fulfilled, the next aim should be to promote the absorption of the extravasated fluid, and re-establish the original tone of the vessels.

The limb should be kept in a horizontal position. Gentle frictions made on the part with flannel; fomenting with a decoction of camomile flowers, containing a little camphorated spirit; the repeated application of cold water from a spring or pump; liniments; electricity; and a moderately tight roller; will tend to quicken the action of the absorbents.

The operation of these means may be promoted by giving internally purgatives, diuretics, and emetics.

If the tumor should not soften under this plan, but become so tense as to occasion pain, inflammation, and the danger of gangrene, the fluid may be discharged by means of small punctures. These, however, are not void of danger; for all wounds in dropsical constitutions, and parts, easily become gangrenous. The punctures, therefore, should be as small as possible.

It is chiefly, however, in cases of anasarca, or those attended with a general dropsy of the whole body, and an extensive extravasation of water in the cellular substance, that scarifications become necessary, and not for the local swelling, implied by the term œdema.

When the œdematous part is inflamed, every thing irritating should be removed. No bandages should now be employed. The

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* Hunter on the Blood, &c. p. 269.

limb should be placed in a horizontal position, and covered with the lot. plumbi acet. Cooling purgatives are to be given, and the antiphlogistic regimen observed. Such inflammation is apt to occasion dangerous sloughing.

CHAP. X.

BURNS.

The injuries of the human body from the application of fire, or heated substances, are all comprised under the name of burns; with this understanding, however, that when the accident is occasioned by boiling water, or other hot liquids, it is generally called a *scald*. Callisen *, and others, consider a burn to be nothing more than inflammation, with its ordinary consequences, brought on by the action of high degrees of heat upon the texture of the body. With this idea, we must associate another, in order to render the definition accurate; viz. that in many severe burns, some of the flesh is destroyed instantaneously by the fire, which actually kills, and even decomposes it, without there being any time or opportunity for previous inflammation.

Burns are mostly divided into four species, or rather degrees. In the first, or mildest, there is but a slight redness of the skin, without any swelling or fever, and only a gentle inflammation is excited, which soon subsides. In the second degree, the redness is attended with swelling, the pain is sharp, and, if the burn be of much extent, and the constitution delicate and irritable, the injury gives rise to more or less symptomatic fever. The inflammation is acute, but it commonly terminates in resolution. In the third degree, vesicles arise either suddenly or gradually, containing a limpid or yellowish fluid, and indicating that the burnt or scalded surface has suffered more from the application of the heated or ignited substance, than in either of the preceding examples. The symptomatic fever is also more severe, the pain greater, shiverings and convulsions sometimes occur, and, unless the vesications be few and small, suppuration cannot be avoided. In the fourth, more or less of the burnt part is deprived of its vitality, or is so injured, that after an attack of violent inflammation, the flesh rapidly mortifies. In large or deep burns, attended with this fourth degree of injury, the constitutional symptoms are usually very severe, the pulse is quick, small, and sometimes irregular, and the disposition to shiverings and convulsions great. However, when the burnt surface is at once destroyed, the case is generally less painful, than other instances in which the degree of injury is somewhat less violent.

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* Systema Chirurgiæ Hodiernæ, t. i. p. 298.

Thus, the two slighter kinds of burns generally admit of resolution, the third case is followed by suppuration, and the fourth by mortification. The quantity of injury depends upon the intensity and duration of the heat applied, and upon the extent of surface upon which it has acted. As heated fluids part with their caloric in being diffused, scalds are often attended with various degrees of injury at different points.

It has been correctly remarked, that every division of burns must be in many respects arbitrary. The phenomena, which occur in the milder species, present themselves also in the more severe; and, we frequently see in one and the same burn, simple inflammation in one place, suppuration in another, and elsewhere, ulceration, gangrene, and mortification. Probably, it is partly from inattention to this circumstance, that so great a diversity of opinion has prevailed, with regard to the best method of treatment. Nor may it have been duly recollected, that the state of a burn is constantly changing, so that the remedies which are proper in one stage may become useless and hurtful in another. The peculiarities of constitution also cause striking diversities in the appearances of burns, and in the effects of remedies upon them. Hence, of several burns resembling each other at first, and treated exactly alike, not two will heal precisely in the same manner. *

The danger of burns is proportioned to the extent as well as the violence of the injury; hence, cases of even the fourth kind, not occupying much space, may be insignificant, while others of the first and second descriptions may be dangerous, and, indeed, actually fatal from their large extent. The danger of scalds is often considerable on account of their size; but burns may be attended with great risk, not merely in consequence of their magnitude, but also by reason of the depth to which the parts are injured or destroyed. The age and constitution of the patient make a good deal of difference in the chance of recovery; burns in delicate unhealthy subjects, and in young children, being more dangerous, than in strong, healthy, adult subjects. The situation of the burn is another consideration of importance; for burns about the head, throat, chest, and abdomen, generally have worse consequences, than similar injuries of the limbs. Burns of the first and second degrees, unless they occupy a large surface, may be said to be usually free from danger, and by proper treatment, the inflammation may almost always be resolved. In cases of the third degree, suppuration commonly follows, and, if the injury be extensive, there may be a great deal of fever, and considerable danger. Large chronic ulcers are also a frequent consequence. Cases of the fourth degree, cæteris paribus, are the most dangerous of all, and never can be cured without a detachment of the dead parts from the living.

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* See Thomson's Lectures on Inflammation, p. 586.

Burnt patients may die from the violence of the inflammation, from the size and depth of the injury, and the shock of it upon the whole constitution, from the severity of the symptomatic fever, from convulsions, from the profuseness of the discharge, or from the effects of gangrene. Extensive burns of the skin frequently bring on great difficulty of breathing; an effect of which every experienced surgeon is aware.

Severe suppurating burns often produce disfiguring, irregular scars, stiffness and contractions of joints, wryness and distortions of parts, irremediable blindness, specks upon the cornea, concretions of the fingers, toes, or eyelids, a closure of the lachrymal passages, or of other ducts and apertures, eversions of the eyelids, and a variety of other deformities and mutilations.

With respect to the treatment, perhaps, we shall find in no branch of surgical practice a stronger disposition to prejudice and credulity. A preposterous belief in the possibility of discovering some particular application, calculated for every sort of burn, and (what is more wonderful) for every stage and state of it, has not been one of the least absurdities which have disgraced this part of the healing art. Yet, one would suppose, it requires but little intelligence to discern, that as all burns are not alike, no single plan of treatment can be invariably right. Too often the salutary operation of the vis medicatrix naturæ has been mistaken for a sort of proof of the good effects of several inert, or pernicious remedies, and it has not been properly remembered how many burns would get well of themselves; nay, how many do actually undergo a cure, notwithstanding all the difficulties created by bad and unskilful surgery. If, however, a proposition at the beginning of this chapter be correct, viz. that the effects of burns are analogous to those of inflammation in general, inclusive of suppuration and mortification, then the same common principles which guide us in the treatment of inflammation and its consequences, ought undoubtedly to form the rule of our conduct in the treatment of burns. Nor can it be questioned, that these accidents must require as much variety of management, as any other cases, in which are exemplified all the different states and stages of inflammation, ulceration, mortification, &c. It would not be more ridiculous to suppose, that all the numberless varieties of gunshot wounds, should be left to the efficacy of some favourite plaster or ointment, than to fancy, that burns of every degree and condition, should have only one sort of dressing; or, that if a change be made, this is not to be regulated by the state of the injury, but rather by the time or period of it. Thus, if we follow the advice of some writers, we are to dress all burns the first day with a certain application; the second day with another; and other alterations follow every rise of the sun. But this mechanical and unscientific way of legislating in surgery by the clock or sun-dial, is totally inconsistent with every notion which I can form of right practice. It must be wrong, inasmuch as the state of burns, at fixed periods after their occurrence, must be infinitely various, not only on account of the different degrees of primary injury, but also because the nature of the patient's constitution, his age, strength, weakness, health, &c. constantly have vast influence over the subsequent appearances of the injured part.

In the treatment of superficial burns and scalds, the indications are to remove the inflammation, and, by this means, prevent the formation of blisters; but, if we fail in this purpose, we must endeavour to hinder the vesications from becoming painful and troublesome ulcers. In a preceding chapter, I have explained the acknowledged efficacy of cold applications in diminishing inflammation, and most of the observations which have been there introduced, might be here repeated. The practice of employing cloth dipt in cold water, or in rose-water, cooled with ice or snow, as dressings for the less severe cases of burns, is as ancient as the time of Rhazes. The plan should be adopted as soon after the accident as possible, it being, as Avicenna has remarked, one of the best ways of preventing the formation of blisters. Another good method, when the situation of the injury will admit of it, is to immerse the scalded or burnt part, in very cold spring or ice water; or else to pour fresh cold water plentifully over the injured surface. Pounded ice *, inclosed in folded linen, or mixed with hog's lard, is another excellent application for scalds and superficial burns, situated on the head, back, and other parts which cannot be conveniently immersed in cold water. It would be endless to enumerate all the different local remedies, which at least in burns unattended with any separation of the cuticle, exposure of the cutis, or ulceration, operate chiefly, if not entirely on the principle of reducing the temperature of the part. Suffice it to mention various spirituous lotions, spirit of wine itself, the lotion of the liquor plumbi acetatis, and the dressing so much in vulgar repute, raw potatoes scraped into a soft pulp. All these applications being colder than the burnt surface upon which they are laid, tend directly to lower its temperature, an effect which they must further produce by their continual evaporation. But, in order to derive the utmost benefit from cold applications, they should be frequently renewed, as they soon become of the same temperature as the parts with which they are in contact.

Although it seems to be generally admitted, that no local remedies are better than such as are cold, for the relief of scalds and superficial burns, there is nearly the same unanimity amongst surgical writers respecting the danger of extending this practice indiscriminately to large or severe injuries of this nature, especially when situated upon the trunk. In extensive burns, however superficial they may be, the patient is liable to be affected with cold shiverings, and these shiverings may be greatly aggravated by exposure, and the application of cold. † Here the liniment of lime-water and

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* Essay on the Means of lessening the Effects of Fire on the Human Body, by Sir J. Earle.

† Thomson's Lectures on Inflammation, p. 591.

linseed oil, and fomentations, will generally be found better, and more agreeable dressings, than refrigerant washes.

In speaking of the treatment of inflammation, I had occasion to notice the curious and seemingly inconsistent facts, of that process being sometimes most benefited by cold, and sometimes by warm applications. We find the same thing exemplified in the milder kinds of burns, and even more; for, if we are to credit a long list of writers, including Aristotle himself, as well as several distinguished moderns, holding the burnt part near the fire immediately after the accident, is an effectual plan of rendering the symptoms milder. This method of *burning the burn*, as the phrase runs, is then not merely a vulgar practice, but a plan sanctioned and seriously commented upon by men of the greatest eminence. Yet, as Professor Thomson justly remarks, the plan, notwithstanding so many authorities in its favour, has never come into general use. The inflammation of superficial burns has a natural tendency to resolution, and, as this happens under the influence of both hot and cold applications, one is almost inclined to believe, that nature, in effecting the cure of most cases of superficial burns, needs but little assistance from art; and that, whatever degree of credit practitioners may take to themselves for the spontaneous results, which occur under different modes of treatment, the cure in reality ought to be ascribed to nature. *

Perhaps we should view in a similar light certain applications, which are said to do good by keeping the burnt surface from the effects of the external air: as, for instance, olive oil, the linseed oil, and lime-water liniment, &c. In those milder burns, where the insensible cuticle is for the most part unbroken, how are we to imagine that the external air could prove so hurtful, even were it possessed of those noxious irritating qualities, which the imaginations of surgical writers, rather than nature, have conferred upon it? If oily liniments, therefore, be really useful in assuaging the effects of superficial burns, (as I believe them to be,) it is better and more philosophical to be content with saying, that experience proves such efficacy, than to venture into fanciful and unfounded explanations of the fact.

Small vesications, if not opened, may subside, but larger blisters should be pricked with the point of a needle, and the fluid let out, without removing the cuticle. In general, every superficial burn of much extent, requires antiphlogistic treatment, venesection, mildly aperient medicines, and other means known to be beneficial in relieving inflammation. Opium is also indispensable in every instance attended with much pain, as it not only diminishes the suffering, and procures sleep, but lessens the disposition to those dangerous convulsions, which carry off a large number of burnt patients. When the injury has been caused by the explosion of gunpowder, the grains are often lodged in the skin, from which they should be delicately removed with the point of a needle.

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* Lectures on Inflammation, p. 592.

We come now to the consideration of the mode of treating the third species of burns, or those which suppurate. As Professor Thomson observes, the suppuration in severe cases may take place by the second or third day, but frequently it does not begin till a later period. It often happens without any appearance of ulceration, just as it does from a blistered surface; and, after continuing some time, it is stopped by the formation of a new cuticle. In other instances, small ulcerations appear on the surface, or edges of the burn. These spread into extensive sores. When suppuration takes place, unaccompained by ulceration, any mild simple dressings will generally heal the part without difficulty. The applications in most repute, are the liniment composed of linseed oil and lime-water; the unguentum zinci; the ceratum plumbi; either of which may generally be employed with advantage immediately cold applications cease to produce benefit.

In the other description of suppurating burns, while the injury is in a very painful state, and the ulceration is extending itself, no applications are better than emollient poultices. Afterwards, when this destructive process has stopped, the secretion of good pus begun, and the surface of the ulcer become clean, and covered with healthy granulations, the unguentum zinci, the ceratum plumbi, or common lint, with a pledget of any simple ointment, may be used as dressings. Should the sore require gentle stimulation, a little of the powder of myrrh and lapis calaminaris may be sprinkled upon it, before the other dressings are applied. No ulcers, however, are so disposed as those of burns, to throw out with surprising rapidity, high fungous granulations, over which the cicatrization proceeds with slowness and difficulty, and, when completed, leaves the part deformed with several indurated knobs and inequalities. The grand means of preventing this exuberance of the granulations, formerly consisted in the skilful application of pressure, by means of a roller, and in touching the surface of the ulcer with the nitrate of silver, or dressing it with unguentum resinæ, with every ounce of which ʒj of the pulv. hydrargyri nitrico-oxydi was blended. So freely, indeed, was this mercurial escharotic employed, that patients were frequently salivated by its absorption, and almost daily teazed with its irritating operation on the sore. But, the improvements in modern surgery have, in a great measure, superseded the necessity for this practice; for, when the situation of a burn is such as to admit of the part being compressed, and the edges of the ulcer approximated with straps of adhesive plaster, it is found, not only that the granulations keep their proper level, but that cicatrization goes on with much greater expedition. The surgeon should alway recollect, however, that this is a method which is as improper for burns, which are in a painful irritable state, with the ulceration spreading, as the use of tight bandages, or of caustic itself, would prove under the same circumstances. So various and multiplied, however, are the conditions and appearances of the sores resulting from burns, that a knowledge of this branch of practice implies that of the right method of treating ulcers in general; a subject to which we shall advert in a future chapter. The concretion of parts is to be prevented by the interposition of lint, the introduction of a probe, tube, bougie, or piece of sponge; and the frequent separation of the surfaces likely to grow together. It is particularly necessary to remember this advice, in burns about the toes, fingers, ears, nostrils, &c. When burns are situated near a large joint, like the knee or elbow, the limb should be chiefly kept in the position in which it would be most useful in the event of an anchylosis taking place. But every possible effort should be made to avert this unpleasant consequence, by gently moving the joint as soon as the state of the burnt part will allow. Should the evil, however, be unavoidable, the future position of the limb is a very important consideration; and, I need hardly observe, that while the lower extremity is most valuable, in the extended or straight posture, the arm, on the contrary, is most serviceable with the elbow bent. The anchylosis, of which I am speaking, is not what is termed true, but arises partly from preternatural adhesions, partly from long inaction of the muscles and tendons, and partly from the absorption of the granulations, after cicatrization, and the subsequent contraction of the skin. The simple division of such shortened portions of the integuments is rarely succeeded by any permanent removal of the wryness, deformity, and immobility of the parts, and after the wound has healed, things generally fall into the old state again. Here the practice suggested by my friend, Mr. Earle*, to cut away the cicatrix, bring the sides of the new wound together in a longitudinal line, and maintain the observance of a better position for a certain time, by means of splints and other mechanical aids, has sometimes materially and permanently lessened the deformity. A modification of the same treatment, introduced by Mr. James, of Exeter, has also proved successful.†

Burns of the latter kind require, from the first, constitutional as well as local treatment; for, when at all extensive, they are always accompanied with a good deal of symptomatic fever, in which the pulse, instead of being strong, full, and hard, as after most other accidental injuries, is generally small, quick, and vibratory. It is this weakness of the pulse which deters practitioners so much from bleeding: a practice, however, which is indispensable in the early stage of severe cases. Perhaps, indeed, the more frequent use of the lancet in this part of surgery, would form a real improvement. As Dr. Thomson observes, in the dry and hot state of the skin, diaphoretics may be used with advantage. Laxatives are often necessary; but, in general, only the gentler sort should be given, on account of the pain which moving always gives to the patient. Here likewise anodynes are frequently necessary, not only to procure sleep, but an alleviation of pain. During the symptomatic fever, a mild, vegetable farinaceous diet is proper; but afterwards, in the suppurating stages, it is essential to support the patient with animal food, wine, and cordials.*

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* Medico-Chir. Trans. vol. v. p. 96. and vol. vii. p. 173., &c.

† Op. cit. vol. xiii.

With regard to the treatment of the fourth species of burns, or those attended with sloughing, I believe we ought to pursue the same general principles, which should regulate our conduct in the treatment of other cases of mortification. The faith put in the superior efficacy of vinegar, spirit of wine, and the linimentum terebinthinæ, as first dressings for these cases, ought certainly not to be unbounded; and I cannot help thinking with Dr. Thomson, that in the early stage of many of these injuries; that is to say, while the skin is unbroken and free from ulceration, it matters little whether we apply vinegar, spirit of wine, or oil of turpentine. None of these substances then come into contact with any raw, exposed, sensible parts, and, therefore, cannot be supposed to do either much harm, or good, at least, as far as any specific quality is concerned. The evaporation of the vinegar, and spirit of wine, however, will tend to cool the parts, and, on this principle, perhaps may be useful. As for the linimentum terebinthinæ, employed in the manner which Dr. Kentish directs, I entertain exactly the same views of the practice as Professor Thomson of Edinburgh. The turpentine is used only just at first, while it can do no harm; that is to say, while it cannot touch or irritate any raw, or ulcerated surface; and then the applications are gradually altered to a milder description. We may, therefore, see a reason for the success of Dr. Kentish's method, without placing the least confidence either in the visionary theories which he suggests, or in the alleged superior virtue of the oil of turpentine, as a general first dressing for burns. With these reflections, I am induced still to profess myself rather an advocate for simple emollient applications in cases of sloughing burns. Common poultices, the liniment of linseed oil and lime-water, and fomentations, are the means which I prefer, until the eschars have separated. The remaining sores should then be treated according to the precepts already hinted at in the present chapter. The constitutional treatment of these cases is precisely similar to that of mortification arising from violent inflammation.

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* Lectures on Inflammation, p. 594.

CHAP. XI.

EFFECTS OF COLD.

Of the general exciting, or stimulant power of heat, as a modern writer observes, there can be no doubt. And, with regard to cold, the disputes, concerning its operation, have been perpetuated only by logical illusion. In common language, we are accustomed to speak of cold as a positive and active energy, while philosophy can acknowledge it only as the expression of a relative decrease of temperature; for any degree of temperature designated by the appellation of cold, is still heat. * The very same temperature may be called hot or cold, according as it is compared with a colder or a hotter temperature. If we warm one of our hands at a fire, while we cool the other by means of ice, and then plunge both of them into water of the common temperature of the atmosphere, the water will feel cold to the hand which has been heated, and warm to the other which has been cooled.

In a physical sense, every temperature of the air, or other surrounding medium, below 98°, might be denominated cold, because this is the common heat of the human body; but with regard to the feelings and the health, a degree much lower, namely, from 60° to 65°, is the most grateful and invigorating. The external medium at the temperature of about 62° appears to abstract the heat of the body in the same proportion in which it is generated, without any extraordinary exertions of the system; and, therefore, neither contributes to exhaust its powers, nor to excite uneasy sensations. Hence, also, the denominations of temperate, warm, hot, cool, and cold, are given to particular degrees of the thermometric scale. The sensations of different men vary, however, according to the power which their respective constitutions possess of evolving heat. This depends much upon the original vigour of the system, especially of the heart and arterial system. It is also much influenced by habit, or by a person's being seasoned to the cold. Hence, people who from vigour of constitution, or from habit, readily evolve a considerable quantity of heat, especially during moderate exercise, can bear with pleasure and benefit to their health, the very same degree of cold, which to the weak and unhabituated, is a source of painful chilliness.

The first effect of certain degrees of cold applied to the human body is to weaken the circulation through the small cutaneous vessels, more especially those which are situated in extreme parts,

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* Kellie, in Edinb. Med. and Surg. Journ. vol. i. p. 505. The latter part of the above remark may be said to be generally true, with respect to any degree of cold of which we ever speak; though rules for calculating the zero of heat have been given. See Essays on Subjects chiefly Chemical, by W. Irvine, M.D.; 8vo. Lond. 1809.

like the hands and feet; or, in projecting parts, as the ears, nose, scrotum, &c. which expose a larger surface to the atmosphere, or medium, by which their caloric is abstracted. Hence the skin becomes pale, and contracting round the miliary glands and roots of the hairs, exhibits a roughness which is compared to the skin of an unfeathered goose, and is technically named the *cutis anserina.* The action of the heart and arteries in general becomes weakened; and the blood, being partially delayed in its course through some of the cutaneous vessels, and not undergoing the change of colour, which a circulation through the lungs produces, it gives a bluish or livid colour to the fingers, ears, and other projecting parts. If the cold be intense, or the exposure long continued, the circulation in the extreme parts becomes altogether interrupted, and the power of evolving heat being completely destroyed, mortification is the consequence. Parts killed in this manner are said to be *frost-nipped* or *frost-bitten.*

From the languor and weakness of the arterial system, produced by the application of cold, other effects on the constitution necessarily accrue. A free circulation of well-oxygenated blood seems essential to the perfect execution of the functions of the brain and nervous system, and to the support of sensibility. If the circulation is suspended for a few moments, as in syncope, the sensibility is also suspended; and, on the other hand, when there is more than an ordinary supply of blood to any part, as in inflammation, the sensibility is highly augmented. Hence another immediate effect of the agency of cold on the human body, is a diminution of the sensibility of parts. This is universally felt in the numbness of the hands and fingers, which, under the impression of cold, are altogether incapable of accurate discrimination of touch: and the whole of the surface of the skin partakes of the imperfect feeling. The tongue is also incapable of distinguishing the peculiar flavour of sapid bodies, if they be extremely cold; and the sense of smell is considerably enfeebled by cold. If the cold be intense, or its application long-continued, the powers of the whole nervous system yield; a torpor of the animal functions ensues; the action of the muscles becomes feeble, and scarcely obedient to the will; an unconquerable languor and indisposition to motion succeed: and drowsiness comes on, ending in sleep, from which the person, if not speedily roused, frequently awakes no more.*

The strong propensity to sleep, following the anxiety and lassitude experienced at an earlier period, is noticed by most writers as the precursor of imminent danger †; and it is certainly a symptom of usual occurrence. But, as an intelligent author remarks, it is doubtful how far the state of sleep is the necessary consequence of simple exposure to cold; or, at least, what other circumstances besides cold are necessary for its production, since this exposure may be made to an intense degree of cold for a considerable length of time, without sleep being induced.[*] The case of Elizabeth Woodcock[†], who lay buried under snow more than a week without sleeping a great deal, and those of some shipwrecked sailors, who were more or less immersed in water, in severe weather, for 23 hours, without being seized with drowsiness, are proofs that an irresistible propensity to sleep is not constant.[‡]

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* See a description of the effects of the cold at Terra del Fuego, on the persons who landed there with Dr. Solander and Sir J. Banks, as detailed in Captain Cook's first voyage.

† Richter, Anfangsgr. der Wundarzn. b. 1. p. 117. Larrey, Mém. de Chir. Mil. t. iv. p. 106. Callisen, Syst. Chir. Hod. pars i. p. 308.

In describing the manner in which the French soldiers perished from the severity of the cold in Russia, Larrey remarks, that their death was preceded by a paleness of the countenance, by a sort of idiotism, difficulty of speech, weakness of sight, and even a total loss of these faculties. In this state, some of the men continued to march for a greater or lesser time, led by their comrades. The action of the muscles gradually grew weaker; the men reeled about as if they were drunk; and their debility increased until they fell down, a certain sign of the total extinction of life. The incessant and rapid march of the troops in close masses obliged those who could not bear it to quit the centre to walk along the side of the road. Separated from this compact column, and left to themselves, they soon lost their equilibrium, and fell into the ditches of snow, from which it was hardly possible for them to get out. Here they were immediately seized with a painful numbness, followed by lethargic drowsiness, and in a few minutes their miserable existence terminated. Frequently, before death, there was an involuntary emission of urine, and sometimes hemorrhage from the nose. Almost all the men who perished in this manner were found lying with their faces downwards. The skin was without alteration of colour, or any appearance of gangrene. In general, death took place more or less rapidly, according as the subject had been fasting a longer or shorter time.[§]

It has been a question whether the human body, after being frozen, can ever be restored to life. Richter asserts the possibility of recovery, *when the blood in the heart itself is not turned into ice; when this organ and large blood-vessels still retain a degree of vitality; and there is no extravasation in the brain* to render the thing impracticable. And he declares that persons, who have lain in a frozen state as long as four and six days, have been restored to life.[‖] After a full consideration of this subject, I think there can be no doubt that Richter is in error; and that the cases of recovery to which he adverts, were only instances of restoration from a state in which suspension of sensation, voluntary motion, &c. had been induced by cold, and not examples in which the whole body, or even the greater part of it had been frozen. In order to ascertain the truth or falsity of an assertion, that some animals, especially serpents and fish, can recover their vitality after being frozen, Mr. John Hunter instituted a number of interesting experiments on the power of different animals in resisting the agency of cold. Two carps were gradually frozen, with the aid of a freezing mixture, and did not recover. It was with great difficulty that he succeeded in freezing a dormouse, such were its powers of evolving heat, and the non-conducting quality of its integuments; and it was not till the hair had been wetted that life was destroyed. This animal also did not recover. When a toad was exposed to a similar cold mixture, the water froze round the animal so as to enclose it, but without destroying life: yet, though not frozen, it hardly ever recovered the use of its limbs. The conclusion drawn from these experiments was, *that an animal must be deprived of life before it can be frozen.* * On the other hand, Hearne says, that spiders, frozen so hard as to bound from the floor like a pea, were revived by being brought to the fire. Leeches, snails, grubs, and frogs, have been frozen to a certain degree by artificial cold, and revived. Other experiments have also proved, that frogs would revive even if the heart was frozen, but not if the brain congealed, after which they could not be affected by the galvanic action. † Captain Franklin, in his Northern Expedition, repeatedly saw fish, especially carp, recover after having been congealed by cold into a solid mass of ice; and one carp recovered so far as to leap about with much vigour, after it had been frozen for thirty-six hours. ‡ We learn from Professor Thomson, however, that in the year 1785, a variety of experiments were made at the Royal Medical Society of Edinburgh, in order to discover some of the effects which exposure to intense degrees of cold produces upon warm-blooded animals. In these experiments it was uniformly observed that death took place long before the irritability of the heart and other internal parts was destroyed, and at a time when the temperature of the blood, circulating in the heart and larger blood-vessels, was but little, if at all, reduced below 60° of Fahrenheit. § How far these various facts can be reconciled by the different effects of artificial and natural freezing, or by the less pernicious operation of severe cold upon similar classes of animals in the polar regions, than in milder climates, I cannot presume to conjecture; but I have no doubt, that, in whatever manner this physiological question may be hereafter settled, with respect to the lower animals, the truth of Mr. Hunter's inference with regard to the human subject, will remain unshaken. Whoever will advert to any of the most remarkable examples on record, where persons have recovered after being exposed for a length of time to extraordinary cold, will find that the particulars by no means justify the conclusion, that such cases were instances in which the whole body, or the greater part of it, had been frozen. We may be sure that this did not happen in the case of Elizabeth Woodcock, who lay buried six feet under the snow, and without food, from Saturday Feb. 2d, to Sunday Feb. 10th, 1799; for it is expressly related that she was sensible the whole time *; a state which cannot be supposed to be compatible with a general congelation of the blood, and other fluids in the system. The French peasant Boutillat was lost in a snow storm on the Black Mountains, which separate France from Spain, and lay asleep under the snow four days; but on the fifth morning he awoke with a sensation of thirst. How could this return of sense and intellect have happened, had the whole mass of the blood been in a frozen state? Or, if it be thought that the fluid was in a state of congelation only while the man lay asleep and senseless, by what alteration of circumstances is the thawing of the blood to be accounted for, since he awoke buried under the snow, breathing through a hollow cone, which, as in the instance of Elizabeth Woodcock, extended from his body to the surface of the snow? † Nor could the circulating fluids have been frozen to a great extent in three other individuals, whose remarkable case is upon record, since, in such condition, they would not have been in constant dread of being starved. ‡ The very existence of sensation and intelligence proves, that, in none of these cases, a completely frozen state of the body or of the blood, could have taken place. Had this last state been induced, no doubt recovery would have been out of all possibility, notwithstanding the contrary sentiments which have been published on this point, by Fabricius Hildanus, Richter, &c. §

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[*] Thomson's Lect. on Inflammation, p. 624.

[†] Reeve's Essay on Torpidity.

[‡] Phil. Trans. 1792, and Currie's Med. Reports on the Effects of Water, vol. i. chap. 15.

[§] Larrey, Mémoires de Chir. Militaire, t. iv. p. 127—129. His description however, is rather that of people dying from the combined effects of cold, hunger and fatigue, than from cold alone.

[‖] Vol. cit. p. 119.

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* See Philosoph. Trans. vols. lxv. and lxviii.; and Hunter on certain Parts of the Animal Œconomy, p. 100, 101.

† Quarterly Review, No. lvi. p. 582.

‡ Franklin's Journey to the Shores of the Polar Sea, p. 248. 4to. 1823.

§ Thomson's Lect. on Inflammation, p. 642.

TREATMENT OF PERSONS IN A STATE OF TORPOR OR SUSPENDED ANIMATION FROM COLD.

One great principle, insisted upon by practical writers, is to let caloric be communicated to the body in the most gradual manner. ‖ From observations and experiments (says Mr. Hunter), it appears to be a law of nature, in animal bodies, that the degree of external

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* Reeve's Essay on Torpidity, p. 109.

† Pilhes, in Journ. de Médécine, Paris, 1767, tom. xxvii.

‡ Narrative of three women saved, who were buried 37 days under the snow, in a stable at Bergemoletto in Italy, by F. Soumis, 12mo. 1759.

§ For many judicious observations on this topic, consult Thomson's Lect. on Inflammation, p. 642—644.

‖ Richter, Anfangsgr. b. i. p. 125. Callisen, Syst. Chir. Hodiern, t. i. p. 309.

heat should bear a proportion to the quantity of life. When life is weakened, this proportion must be adjusted with great accuracy, but, when the powers of life are considerable, a greater latitude is allowable. "I was led (he observes) to make these observations, by attending to persons who are frost-bitten, the effect of cold in such cases being that of lessening the living principle. The powers of action remain as perfect as ever, but weakened, and heat is the only thing wanting to put these powers into action; yet, that heat must at first be gradually applied, and proportioned to the quantity of the living principle, which increasing, the degree of heat may likewise be increased. If this method is not observed, and too great a degree of heat is at first applied, the person, or part, loses entirely the living principle, and mortification ensues. Such a process invariably takes place with regard to men: and the same thing, I am convinced, happens to other animals. For, if an eel is exposed to a degree of cold, sufficiently intense to benumb it till the remains of life are scarcely perceptible, and still retained in a cold of about 40°, this small proportion of living principle will continue for a considerable time, without diminution or increase; but, if the animal is afterwards placed in a heat about 60°, after showing strong signs of returning life, it will die in a few minutes. Nor is this circumstance peculiar to the diminution of life by cold. The same phænomena take place in animals, which have been very much reduced by hunger. If a lizard or snake, when it goes to its autumnal hiding place, is not sufficiently fat, the living powers are, before the season admits it to come out, very considerably weakened, perhaps so much, as not to permit of the animal being again restored. If animals in a torpid state are exposed to the sun's rays, or placed in any situation, which by its warmth would give vigour to those of the same kind, possessed of a larger share of life, they will immediately show signs of increased life, but quickly sink under the experiment, and die; while others, reduced to the same degree of weakness, as far as appearances can discover, will live for many weeks, if kept in a degree of cold proportioned to the quantity of life they possess. "I observed many years ago, (says Mr. Hunter,) in some of the colder parts of this island, that, when intense cold had forced blackbirds or thrushes to take shelter in outhouses, such of them as had been caught, and were, from an ill-judged compassion, exposed to a considerable degree of warmth, died very soon." *

I have deemed it advisable to cite these sentiments of Mr. Hunter, with some of the facts upon which they are founded, in consequence of my having read, in some modern works of high repute and extensive circulation, that, in cases of suspended animation, or torpor from cold, the patient may be safely brought into a warm, but well ventilated room, chafed with warm flannels,

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* Observations on certain Parts of the Animal Œconomy, by J. Hunter, 4to. p. 137. 2d edit. Lond. 1792.

and his feet and legs immersed in warm water.* Dr. Kellie does not think the same caution and reserve necessary in the application of heat to a case of general torpor, as to benumbed and frost-bitten limbs. In the latter occurrence, he admits, heat should be very gradually communicated, but (says he) surely we would not commence the treatment of a case of general torpor, nearly approaching to death, by applying snow to the body. He argues, that there does not appear to be the same danger of violent re-action, or of destroying by premature stimulation, an accumulated excitability in general torpor, where the sensorial functions have been all along suspended, as in a partial affection, where, notwithstanding the injury done to the part, the general powers of the system have remained excitable. Notwithstanding the ingenuity of the reasoning which Dr. Kellie has adopted, I am far from thinking the practical principles, to which the observations of Mr. Hunter tend, are at all erroneous. The case related by Dr. Kellie was not an example in which the vital powers were reduced altogether by cold. The temperature to which the individual had been exposed was not indeed depressed to a degree generally incompatible with activity and life, but he was reduced by fatigue and fasting, and the effects of the atmospheric cold were increased by the drizzling rain which fell. The blood which flowed from the arm was judged to be of its natural temperature. This was, therefore, a case in which the temperature of the patient could hardly have been low enough to afford any criterion of the safety or danger of suddenly exposing a person to much warmth, who has been subjected to the effects of intense cold. If the facts mentioned by Hunter had left this matter doubtful, we might still be convinced of the truth of his observations by other events upon record. The limbs of the peasant Boutillat, whose case I have already noticed, were covered with warm linen, dipped in aromatic liquors; his feet mortified, and he lost his life. These consequences, Dr. Pilhes thinks, might have been avoided by the use of cold applications.† The ample experience of Larrey, who was an eye-witnes of all the disasters of Napoleon's campaign in Russia, appears also to confirm the truth of the principle inculcated by Hunter, Richter, Callisen, &c. In describing the sufferings of the French army from the rigour of the climate, Larrey exclaims, "Woe to the man benumbed with cold, whose animal functions were nearly exhausted, and especially whose external sensibility was destroyed if he entered too suddenly into a warm room, or came too near the fire of a bivouac! The prominent parts, benumbed or frozen at a distance from the centre of the circulation, were seized with gangrene, which made its appearance at the very instant, and spread with such rapidity, that its advances were perceptible by the eye, or the individual was suddenly suffocated with a kind of turgescence, which appeared to affect the brain and lungs: he perished as in asphyxia. Thus died the chief apothecary of the Guards. He had arrived at Kowno without any accident, but his strength was much reduced by cold and abstinence. An asylum was offered him in a warm apartment in the pharmacy of the hospital. He had scarcely been a few hours in this atmosphere, so new to him, when his limbs, in which he had lost all feeling, became considerably swelled, and he expired soon afterwards in the arms of his son and one of his colleagues, incapable of uttering a single word. We saw some individuals fall down stiff-dead in the fires of the bivouacs," &c. *

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* Kellie, in Edin. Med. and Surgical Journ. vol. i. p. 312. Rees's Cyclopædia, art. *Cold.*

† Journ. de Médécine, tom. xxvii.

In describing the treatment of a person in a state of torpor, or suspended animation from cold, Callisen and Richter rigorously adhere to the principle, that caloric should be very gradually communicated to the body. The former recommends long-continued frictions with snow, or cloths wet with very cold water. This is to be done in a cold room, and he advises the surgeon not to let his endeavours cease too soon, as patients, after lying without signs of life for several days, have yet been snatched from the jaws of death. On the return of sense, motion, and warmth, aromatic spirituous applications may be used; the temperature in which the body is placed may be raised, and cordials administered. † When signs of vitality return, Richter directs strong volatiles and sternutatories to be applied to the nostrils, air to be blown into the lungs, and the fauces to be tickled with a feather. He also recommends the introduction of tobacco-fumes up the rectum, a practice, however, the propriety of which is questionable in all cases of suspended animation, on account of the debilitating, and even deleterious, effects of that plant. It might be better to throw warm wine into the large intestines, or inject it by means of a hollow bougie down the œsophagus. When the signs of returning animation increase, the body is to be rubbed with brandy, and conveyed into a warmer situation. A diaphoretic drink is then to be given, and, as soon as the patient has been well dried, he is to be put to bed, and remain there till he begins to sweat. ‡

Possibly these eminent surgeons may have extended the principle too far in directing the body to be at first covered or rubbed with snow. But I think we have every reason to believe, that their method of allowing the heat to be communicated only by degrees, is the most likely to be conducive to recovery.

TREATMENT OF FROZEN PARTS.

As in all the experiments which Mr. Hunter made upon the freezing of whole animals, he had never seen life return by thawing,

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* Mém. de Chir. Mil. tom. iv. p. 134, 135.

† Callisen, t. i. p. 309.

‡ Richter's Anfangsgr. b. i. p. 123.

he was desirous of ascertaining how far parts were similar to the whole in this respect. He froze the ears of rabbits, and the combs and wattles of cocks, till the parts were so stiff and hard, that when cut, they flew from the blades of the scissars like a chip, and no pain nor bleeding ensued. After being thawed, they inflamed considerably; but, in the end, perfectly recovered. There was thus a material difference in the result of his experiments, on the whole of some of the more perfect animals, and on parts of them. But, though it was thus fully proved, that parts of such animals might be frozen, and restored to their natural state, it was not known whether this would happen in the more imperfect animals. Mr. Hunter, therefore, froze the tails of a tench, and two gold fishes, and endeavoured to restore the vitality of the parts, by putting the fish into cold water; but the tails, when thawed, did not resume their original appearance, the fish were suspended with their heads perpendicularly downwards, and ultimately died. All his other trials to restore the life of other cold-blooded animals, or of parts of them, after they had been frozen, also entirely failed.* Spallanzani also found, that the irritability of the muscles of frogs, toads, and lizards was not destroyed by keeping these animals a good while in snow; but that, if the cold was increased, so as to freeze any part of them, the frozen part was invariably killed, and rendered insensible to stimuli.†

The experiments, however, on warm-blooded animals corroborate what has long been believed, that when a part of the human body is simply frozen, without any impairment of its organization, it may often be recovered by the *gradual* communication of caloric to it. What parts of the human body admit of being frozen, without the destruction of life, and how long they may remain in this state with impunity (as Dr. Thomson remarks), are points, which observation does not hitherto appear accurately to have determined: but we know, that portions of the cheeks, ears, and nose, have often been frozen by exposure to cold, and yet, that by a proper management the vital functions of these parts have been restored. It seems probable, therefore, that a small part of the cutaneous texture may be frozen for a short period, without the necessary destruction of its vitality. But Dr. Thomson considers the restoration of a frozen limb a matter of impossibility; and in the course of his reading, he has not met with a single unequivocal instance of such an event.‡ On this point he differs from Callisen and Richter, quite as much as upon the other question of the possibility of reviving the whole body, after it has been frozen. Whatever doubts may have been suggested, concerning the propriety of keeping patients out of a warm temperature, who are in a state of torpor and insensibility from cold, none exist with respect to the prudence of extending this principle to the treatment of very cold or actually frozen parts of the human body. If a limb, that is not indeed frozen but excessively cold, be suddenly warmed, chilblains, frost-bite, and other more extensive forms of inflammation, are the result. The part swells, turns livid, and becomes affected with insupportable darting pain. And when a part actually frozen is thus quickly warmed, the same symptoms arise, but in an aggravated degree, and rapidly end in mortification.*

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* Obs. on certain Parts of the Animal Œconomy, p. 124, 125.

† Opuscules de Physique, t. 1. p. 118.

‡ Lectures on Inflammation, p. 628. 642.

In this chapter I have already cited some facts †, strongly illustrative of the danger of exposing very cold, or frozen parts to the fire; but, perhaps, on no occasion has the thing been more forcibly proved, than in the campaign of the French army about the period of the battle of Eylau. During the three or four severely cold days previous to this action, the mercury had fallen to 10, 11, 12, 13, 14, and 15 degrees below the zero of Reaumur's thermometer, and yet, until the second day after the battle, not a single soldier complained of any accident from the effect of the cold. "We had, however," (says Larrey), "passed these days, and a great part of the nights of the 5th, 6th, 7th, 8th, and 9th of February in the snow, exposed to the most inclement frost." In the night, however, between the 9th and 10th, the temperature suddenly rose to 3, 4, and 5 degrees above zero, accompanied with sleet. A thaw then commenced, and, from this moment, numerous soldiers began to complain of acute pain in their feet, numbness, sense of heaviness, and annoying pricking pains in their limbs. The parts were but little swelled, and of a dark red colour. In some individuals, a slight redness was observed at the base of the toes, and upon the instep; while, in others, the toes had lost all power of motion, all sensation and warmth, and become black and dried. These patients, without exception, declared, that they had felt no uneasiness while the severe cold lasted, and that their complaints first began at the commencement of the thaw. From these facts, Larrey argues, that cold is not an exciting, but only a predisposing cause of inflammation and gangrene‡ ; a truth which Richter appears to have been well aware of, when he observes, that cold alone, even the most intense, will never produce chilblains.§

In order to thaw a frozen part gradually, it is best to rub it with snow, or ice and cold water, until sensibility and motion return. If the ear, or tip of the nose, be the part concerned, care must be taken to avoid breaking it. As soon as marks of sense and motion are discerned, the friction may be made with brandy, or camphorated spirit of wine. The patient may then have some gently diaphoretic drink, such as a little mulled wine, a basin of tea, &c. and be put to bed, in a chamber where there is a fire. Here he is to remain until he begins to perspire, when a perfect recovery of whatever sensibility may have been lost generally succeeds.

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* Richter, Anfangsgr. der Wundarzneykunst, b. i. p. 120.

† From Larrey's Mém. de Chir. Mil. t. 4.

‡ Mémoire sur la Gangrène sèche causée par le Froid, &c. in op. cit. t. ii. p. 60.

§ Richter, b. i. p. 124.

When a part is almost in the state of gangrene, in consequence of improper exposure to sudden heat, sometimes its recovery may still be accomplished by immersing it in water of a temperature nearly as low as the freezing point. The part must be kept immersed, until the swelling, pain, and marks of discolouration begin to diminish, when frictions with brandy, &c. may commence, and the warmth be gradually increased.

CHILBLAINS.

A chilblain, in the mild stage, is a moderately red tumour, occasioning heat and itching, The complaint after a time spontaneously disappears. In a more severe state, the tumour is larger, redder, and sometimes of a dark blue colour, and the heat, itching, and pain are so vehement, that the patient cannot use the part. In a still severer case, small vesicles arise, which bursting and leaving excoriations, soon change into sores. The ulcers secrete a thin matter, penetrate deeply, and are very slow in healing. In the worst cases, the inflammation ends in mortification, which is often preceded by the formation of bloody vesicles on the tumour.

The sudden warming of a cold part, and the sudden cooling of a heated part, seem particularly conducive to chilblains; hence, parts most exposed to the vicissitudes of heat and cold are most subject to the complaint; as, for instance, the toes, fingers, nose, ears, and lips. When a part is exposed to sudden cold, while it is in a state of perspiration, it is more likely to be affected with chilblains, than when thus exposed while simply warm. The most intense cold alone cannot produce true chilblains, though analogous complaints do remain in limbs which have been frozen. The more irritable and tender the skin is, the more readily the complaint arises. Children, especially those subject to scrophula, young persons, females, and all who are brought up tenderly, who keep themselves warm, and unexposed to the air, and who perspire much in the feet, are particularly liable to chilblains.

One of the best application to chilblains of the first and second sort, is ice-cold water. The part affected is to be immersed in it a few minutes, two or three times a day, until the complaint quite disappears. This event usually happens in less than four days. After every application, the part is to be well dried and covered with leather socks.

In some cases, tonics and astringents have the best effect, such as diluted muriatic acid; the saturnine lotion; spir. vini camph.; tinct. myrrhæ; the alum lotion, and vinegar. In other instances, oleum terebinthinæ mixed with the balsam. copaivæ; the linimentum camphoræ; the linimentum ammoniæ; tincture of cantharides diluted with soap liniment; and a mixture of two parts of spir. vini camph. and one part of liquor plumbi acet., have proved the best applications.

Suppurating chilblains require topical stimulants, such as warm vinegar; a mixture of liquor plumbi acet. and aq. calcis; or a salve containing the hydrarg. nitrico-oxydum; and frequently it is necessary to touch the ulcers with the argentum nitratum.

Gangrenous chilblains must be treated according to the rules explained in the chapter on mortification.

CHAP. XII.

WOUNDS.

By a wound, surgeons imply a recent, suddenly-formed breach in the continuity of the soft parts, attended at first with hemorrhage, and generally produced by an external mechanical cause.

In a few instances, however, breaches of continuity, both in the soft and hard parts, are suddenly caused by the violent action of the muscles, which either tear themselves asunder, break the bones, or rupture the tendons with which they are connected. Sometimes, also, the sharp point of a broken bone wounds the superincumbent integuments, and changes the case into a compound fracture. Here we see that the cause is mechanical, but not of an external kind, as in ordinary examples.

Wounds are divided into several kinds, the distinctions being founded either upon the sort of weapons with which the injury was inflicted, or upon the circumstance of a venomous matter having been inserted into the part; or, lastly, upon the particular situation of the wound, and the nature of the wounded parts themselves. Hence we have *cuts*, *incisions* or *incised wounds*, which are such as are produced by sharp-edged instruments, and are generally free from all contusion and laceration. The fibres and texture of the wounded part have suffered no injury but their mere division, and there is, consequently, less tendency to inflammation, suppuration, gangrene, and other bad consequences, than in the generality of other wounds. Incised wounds also may usually be healed with greater quickness and facility than others, which are more or less contused or lacerated: the surgeon has only to prevent the solution of continuity from gaping, or, in other words, he has simply to bring the opposite sides of the wound into contact with each other, and keep them in this state a few hours, and they will unite and grow together.

Another class of wounds is *stabs*, or *punctured wounds*, caused by the thrust of pointed weapons, like bayonets, lances, swords, daggers, &c., and also by the accidental and forcible introduction of considerable thorns, large nails, &c. into the flesh. These wounds frequently penetrate to a great depth, so as to injure large blood-vessels, nerves, viscera, and other organs of importance; and as they are generally inflicted with much force and violence, the parts suffer infinitely more injury than what would result from their simple division. It should also be noticed that a great number of the weapons, or instruments, with which stabs are inflicted, increase materially in diameter, from the point towards their other extremity; and hence, when they penetrate far, they must force the fibres asunder, like a wedge, and cause a serious degree of stretching and contusion. It is on this account that bayonet wounds of the ordinary soft parts are very often followed by violent inflammation, extensive swelling, large abscesses, fever, delirium, and other very unfavourable symptoms. The opening which the point of such a weapon makes, is quite inadequate for the passage of the thicker part of it, which can only enter by forcibly dilating, stretching, and otherwise injuring the fibres of the wounded flesh.

A third description of wounds is the *contused* and *lacerated*, which strictly comprehend, together with a variety of cases produced by the violent application of hard, blunt, obtuse bodies to the soft parts, all those interesting and common injuries denominated *gun-shot wounds*. Many bites also rank as contused lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon, which does not operate by means of a sharp edge, or point, must be a contused or lacerated wound.

Poisoned wounds are those which are complicated with the introduction of a venomous matter, or fluid, into the part. Thus the stings and bites of a variety of insects afford us examples of poisoned wounds. But a more serious and dangerous instance, which we meet with in this climate, is seen in the cuts accidentally received in the dissection of dead bodies, or in handling instruments infected with any irritating or venomous matter, as sometimes happens to the surgeon in the performance of operations on gangrenous limbs, and in dressing venereal and other infectious ulcers. The most dangerous, however, of all the poisoned wounds which ever occur in this kingdom, are those caused by the bite of the viper, and by that of several rabid animals, especially the dog and cat.

Wounds are farther divided by surgical writers into those of particular regions, or parts of the body: thus, we have *wounds of the head, face, throat, chest, abdomen, limbs, arteries, veins, nerves, lungs, liver, &c. &c.*

Wounds may likewise be universally referred to two other general classes, viz. *simple* and *complicated*. A wound is called *simple* when it occurs in a healthy subject; has been produced by a clean, sharp-edged instrument; is unattended with any serious symptoms; and the only indication is to re-unite the fresh-cut surfaces. A wound, on the contrary, is said to be *complicated* whenever the state of the whole system, or of the wounded part, or wound itself, is such as to make it necessary for the surgeon to deviate from the plan of treatment requisite for a common simple wound. The differences of complicated wounds, therefore, must be very numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage; nervous symptoms; excessive pain; tetanus; a great degree of contusion; the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels; the presence of foreign bodies, or of a poison, or irritating matter in the part; loss of substance; the attack of hospital gangrene, &c.

All large or deep wounds are followed by more or less symptomatic fever. According to Professor Thomson, it usually comes on at a period varying from sixteen to thirty-six hours after the receipt of the injury; but, as far as my observation extends, the attack is frequently much earlier than the time here specified. Its occurrence is indicated by a greater warmth of the skin; by an increase in the frequency, and generally also in the strength of the action of the heart and arteries; by anxiety, thirst, and a suppression of the powers of digestion. The symptomatic fever from wounds is generally of the inflammatory character; and it even sometimes happens that a very high degree of it takes place in debilitated constitutions, and in persons who have lost a considerable quantity of blood. In these latter cases, however, the frequency of the pulse is said to be more remarkable than its strength, and the fever rather to put on the asthenic, than the truly inflammatory type. It is of great consequence to attend to the character of this fever; for the loss of blood, which may be required and sustained with impunity in one species of fever, may prove highly injurious, if not fatal, in the other.*

The danger of wounds is proportioned to their size; the degree of violence done to the fibres in addition to their mere division; the little power which the part has of repairing its injuries; its great importance to the constitution; the size of the injured blood vessels and nerves; and the age and state of the patient's constitution.

1. The removal of a large adipose tumour is often accomplished without injuring any part of importance, and yet the magnitude of the wound may occasion death.

2. A man cannot bear a large incised, and lacerated wound equally well; because in the latter case, the fibres are not only divided, but stretched, and otherwise injured. I have seen the integuments, covering the anterior surface of the tibia, torn in a straight direction, from the upper head of that bone, nearly to the foot: a rapid mortification of the limb took place, and the man died. Had this been a simple incision, such fatal consequences would probably not have happened, since the wound of amputation, even when a bulky thigh is removed, is not frequently the cause of death. All contused and gun-shot wounds are, for this reason, more perilous, than if they were simple breaches of continuity.

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* See Thomson's Lect. on Inflammation, p. 292.

3. Joints seem to possess but little power of repairing their accidental injuries, which often induce a state of irremediable disease in the part, or so violent a disturbance of the whole system, that the patient loses his life. I here more especially allude to wounds of the large joints; for the smaller articulations generally bear extensive injuries as well as most other parts. Some other parts are also prevented from readily healing, owing to the continual or frequent passage of fluids through them. This is the case with all the ducts and outlets of secreting organs, the intestinal canal, the arteries, &c.

4. The slightest wound of a part, the functions of which are intimately connected with life, is often fatal; the brain, stomach, &c.

5. When large arteries are injured, the hemorrhage if not immediately stopped, will destroy life in a few seconds; and, when the main artery and nerve of a part are both divided, there is generally a considerable risk of mortification, in addition to the first danger from the bleeding.

6. Wounds in young, strong, healthy subjects generally heal more quickly and favourably, than in persons of advanced age, and impaired constitutions.

INCISED WOUNDS.

An effusion of blood from the divided vessels, pain arising from the division and exposure of nerves, and a gaping of the wound, or separation of its edges from each other, are the immediate effects of a wound of the skin, or flesh, with a sharp cutting instrument.

Anatomy teaches us that almost every part of the body is furnished with a vast number of blood vessels, which, indeed, exist in such myriads that it is impossible to prick the skin with the point of the finest needle, without opening one or more ramifications of vessels containing blood, which fluid instantly oozes out. But this effect always happens in a greater and more remarkable degree when there is an extensive cut in the skin or flesh; and if any of the wounded vessels be above a certain magnitude, the hemorrhage may be profuse, and even immediately fatal.

The same experiment which demonstrates the presence of blood vessels in every situation, namely, pricking any part of the body with a needle, proves also, that filaments of the nerves exist every where, and at every point; for the slightest prick of the skin occasions pain; and pain cannot happen except where there are nerves. The pain of wounds is observed to be more or less acute, according to the kind of cutting instrument with which they have been inflicted; the extent of the division; and, especially, according as the individual happens or not to be in expectation of the receipt of the injury. A patient, on whom an operation is to be performed, turns his whole attention to the effect which the use of the knife will produce upon his feelings, and he suffers a great deal; but if an incision be made when not expected, or when the mind is intent on other things, the agony is more moderate. Thus, a soldier may be wounded in the heat of battle, and not feel the hurt till the bleeding attracts his notice.

When the skin, or flesh, is divided with a cutting instrument, the edges of the wound separate from each other, and the injury presents a gaping appearance. The instrument itself, acting like a wedge, must unavoidably separate the parts between which it enters; but, if this were the only cause, the gaping would be very inconsiderable. We find, however, that the opposite surfaces of many wounds are drawn away from each other several inches, and the principal causes to which the phenomenon is to be ascribed, are the natural elasticity of the skin, cellular membrane, fasciæ, &c.; and power of contraction, inherent in the muscles.

The quality of elasticity which belongs to most animal substances, and is inherent in them even after they have been deprived of life, does not prevail in an equal degree in every texture. Hence, the degree of separation, produced by this cause, varies considerably, according to the nature of the wounded parts. The edges of an incision in the skin become widely drawn asunder, because the integuments are endued with great elasticity. The cellular membrane, when cut, gapes very little, because it is less elastic. The extremities of a divided artery recede far from each other; the retraction being far greater than what happens in divided veins, which possess a much smaller share of elasticity. The muscles, also, are not remarkably elastic; yet, the sides of these wounds, especially those of the transverse kind, are always considerably separated from each other; but, this is not altogether owing to elasticity, but chiefly to a vital power of contraction inherent in muscular fibres.

The separation of the edges of a wound is also not always in proportion to the elasticity of the parts, but depends in some measure upon the degree of tension in which they happen to be at the moment of the injury. A simple experiment proves the truth of this observation: if the skin covering the knee be divided transversely in a dead subject, while the leg is bent upon the thigh, and another similar incision be made in the knee, while the leg is extended, the separation which happens between the lips of these wounds will be found to be much greater in the first than the second example.

The prognosis of incised wounds varies according to the extent and depth of the division, the nature of the injured parts, and several circumstances which rank as complications. Deep large wounds are more dangerous and difficult to cure, than those which only interest the skin. Wounds, accompanied with injury of large blood vessels, or nerves, are more or less dangerous, according to the magnitude and importance of those vessels and nerves, and the possibility, or impossibility of obtaining speedy surgical assistance. Simple cut wounds, in which the only indication is to bring the divided parts together, are the most favourable cases of all. On the other hand, complicated incised wounds are more or less serious and hazardous, according to the particular nature of the complication, whether this be a wounded artery, vein, or nerve of magnitude and importance; a wounded excretory duct; a wounded bowel; a wounded trachea; œsophagus, &c. The complications also of bad health, and very advanced age, are other considerations which should influence the prognosis. Generally speaking, the most dangerous examples of incised wounds are those which are made about the throat, by persons who attempt to destroy themselves. Here there are so many large blood vessels, nerves, and other organs of importance, that deep incised wounds too often prove fatal, either immediately, or in a short time. Sometimes the patient opens the carotid artery, and perishes of hemorrhage on the spot, before any assistance can be rendered. In other instances, he divides some of the principal branches of the external carotid, and after losing a great deal of blood, faints, in which state the hemorrhage may cease for a little while. The fainting, indeed, is often the very thing which saves his life, by checking the effusion of blood until the surgeon arrives, who ties the vessels as soon as they begin to bleed again. Incised wounds of the extremities, when such arteries as the femoral and brachial are injured, may also suddenly destroy the patient by the great quantity of blood sometimes lost before the arrival of surgical assistance.

I shall next consider the treatment of incised wounds.

In these cases, there is frequently nothing to be remedied, except the simple breach of continuity, the cut fibres not having been stretched, contused, nor lacerated. When no artery of importance is divided, and no extraneous bodies are lodged in the wound, the duty of the surgeon consists in promoting the re-union of the divided surfaces without delay.

It often happens, however, that considerable vessels are injured, and then the bleeding demands primary attention.

CHAP. XIII.

MEANS OF STOPPING HEMORRHAGE.

In every wound, the bleeding demands the earliest attention, because, if loss of blood be not prevented without delay, the patient will frequently die in the course of a few seconds or minutes. Every other consideration may be deferred; but, when large vessels are injured, they must be immediately secured, or else the sudden death of the patient will leave the surgeon no opportunity of exhibiting his skill and usefulness in other matters connected with the treatment.

Previously to considering what surgical means are best calculated for stopping hemorrhage, it seems right that I should endeavour to give the reader some notion of the nature of the process, by which the bleeding from wounded arteries is permanently suppressed. Arteries, as Dr. Jones observes, are supplied not only with small arteries and veins (the vasa vasorum), but also with absorbents and nerves, and have, in these respects, a similar organization to the other soft parts of the body. This structure makes them susceptible of every change to which living parts are subjected in common, enables them to inflame when injured, and to pour out coagulating lymph, by which the injury is repaired, or the tube is permanently closed.* In short, the coats of arteries inflame, and pass through all the stages of adhesion, suppuration, or gangrene, in the same manner as the skin, a gland, or a muscle.†

Surgeons formerly entertained various theories concerning the process, by which the hemorrhage from divided arteries was suppressed; but, as none of these seemed altogether satisfactory, the late Dr. Jones was led to undertake a series of interesting experiments, the results of which enabled him to give a more correct view of the subject; and, from these investigations, it appears, that when an artery of moderate size is *divided*, the bleeding is stopped in the following manner: An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate, and almost simultaneous effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused in the cellular substance, between the artery and its sheath, and passing through that canal of the sheath, which had been formed by the retraction of the artery, flows freely outward, or is extravasated in the surrounding cellular membrane, in proportion to the open, or confined state of the external wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating, or stretching the cellular fibres which connected them. These fibres entangle the blood as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which is completed by the blood gradually adhering, and coagulating around its internal surface, till it completely fills it up from the circumference to the centre.

The hemorrhage is checked by the effusion of blood into the surrounding cellular substance, and between the artery and its sheath; but, particularly, by the diminished velocity of the circulation, occasioned by the bleeding, and by the quick manner in which the blood always coagulates, when the action of the vascular system is much diminished.

Thus a clot over the mouth of the artery, within its sheath, called by Dr. Jones the *external coagulum*, presents the first complete barrier to the effusion of blood.

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* Treatise on the Process employed by Nature in suppressing the Hemorrhage from Divided and Punctured Arteries; and on the Use of the Ligature; concluding with Observations on Secondary Hemorrhage, p. 5. 8vo. Lond. 1805.

† Hodgson on the Diseases of Arteries and Veins, p. 1. 8vo. Lond. 1815.

The mouth of the artery being no longer pervious, and having no collateral branch very near it, the blood, just within it, is at rest, coagulates, and forms, in general, a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, which lies near the extremity of the vessel. This coagulum is distinct from the former, and is named by Dr. Jones the *internal coagulum*.

In the mean time, the cut extremity of the artery inflames, and the vasa vasorum pour out lymph, which is prevented from escaping by the external coagulum. This lymph fills up the extremity of the artery, is situated between the internal and external coagula of blood, is somewhat intermingled with them, or adherent to them, and is firmly united all round to the internal coat of the artery.

The permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph; but, while it is forming within, the extremity of the artery is further secured by a gradual contraction, which it undergoes, and by an effusion of lymph between its tunics, and in the cellular membrane surrounding it. Thus, these parts become thickened, and so completely incorporated with each other, that one cannot be distinguished from the other; the canal and mouth of the artery becoming obliterated, and blended with the surrounding parts.

When the wound in the skin is not healed by the first intention, an exudation of coagulating lymph gives a covering to the end of the vessel, and separates it from the cavity of the wound.

In the inferior portion of the divided artery, the orifice of the vessel is generally more contracted, and the external coagulum is much smaller.

The extremity of the artery, as far as the first collateral branch, afterwards gradually contracts, till at length its cavity is completely obliterated, and its tunics assume a ligamentous appearance.

The external coagulum, which stopped the hemorrhage in the first instance, is absorbed in a few days, and the thickening of the parts, from the extravasation of lymph, gradually diminishes.

If the end of the artery be examined, at a still later period, it will be found to be reduced to a mere filamentous state, as far as its first branch, and the anastomosing branches are considerably enlarged.

Another fact, made out by Dr. Jones is, that, when the division of an artery has happened near a lateral branch, no internal coagulum is formed.

When an artery is *punctured*, or only *partially divided*, the blood is effused in the cellular substance, between the artery and its sheath, for some distance, both below and above the wounded part. On examination, a short time after the hemorrhage has stopped, a stratum of coagulated blood is found between the artery and its sheath, extending from a few inches below the wounded part, to two or three inches above it, and is somewhat thicker, or more prominent, just over the wounded part, than elsewhere.

In consequence of the space between the artery and sheath becoming filled with blood, and the latter part distended, the relative situations of the punctures in it and the artery are altered, and thus a coagulum of blood becomes confined by the sheath over the puncture in the vessel, and stops the hemorrhage. But this is only a temporary barrier; and the permanent stoppage of the bleeding is effected by reparation, or obliteration.

Dr. Jones's experiments also prove, that if an artery be wounded only to a moderate extent, it is capable of re-uniting, and of healing so completely, that, after a certain time, the cicatrization cannot be discovered, either on its internal, or external surface; and that even oblique and transverse wounds (which are attended with more gaping than longitudinal ones), when they do not open the artery to a greater extent than one fourth of its circumference, are also healed, so as to occasion little or no obstruction in the canal of the artery. But, as Petit observed, this can hardly ever happen, except when the aperture in the vessel has been of very moderate size.* In larger wounds, the vessel is rendered impervious by the effusion of lymph; and, when the division is still more extensive, the partially divided part of the vessel becomes either torn, or ulcerated through.†

1. TOURNIQUET.

A modern tourniquet, a good specimen of which is represented in the next page, consists of a band and buckle, a pad, and two brass frames, the upper one of which is furnished with two small rollers, and the lower with four, over all of which the band plays, so as to facilitate the action of the screw. When the handle of this is turned to the right or left, the band is tightened, or relaxed, in the exact degree which the surgeon wishes. The piece of leather, under the lower brass frame, hinders the skin from being hurt at this point by the pressure of the edges of the hard metal. The buckle is prevented from having this effect by its being always fastened over the pad. The band is first buckled round the limb in such a manner, that the pad, which is attached to the band, is placed exactly over the artery. The two brass frames, with their respective rollers over which the band proceeds, are then made to separate from each other to the requisite distance by turning the screw, and thus the due degree of pressure is produced.

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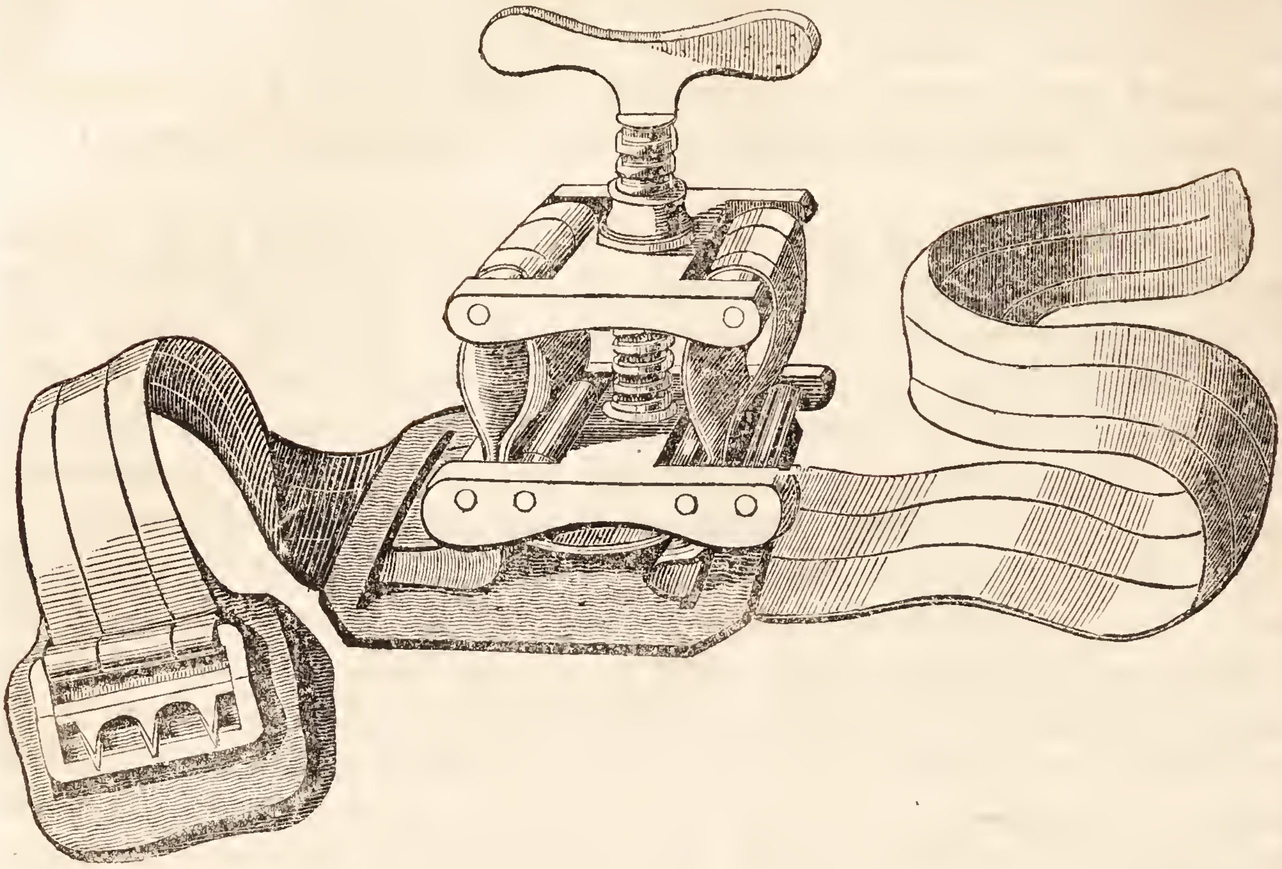
* Mém. de l'Acad. Royale des Sciences, an. 1735.

† Jones, op. cit. chap. i. sect. 3. and chap. ii.



The advantages of this instrument are so considerable, that its first invention constitutes a great epoch in the annals of surgery. The pressure may be regulated with the utmost exactness, and it operates with most force on the point where the pad is placed, and under which the main artery lies. The instrument does not require the aid of an assistant to keep it tense; it completely commands the flow of blood into a limb; it may be relaxed, or tightened in a moment; and when there is reason to fear a sudden renewal of bleeding, it may be left slackly round a limb, and, in case of need, made tense in an instant.

Its operation, however, is limited to the limbs, and as the pressure, necessary to impede the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made very long, without inducing gangrene. Hence, it is only a temporary expedient for the stoppage of bleeding, generally discontinued immediately the surgeon has had time to adopt other means of a more permanent nature.

The tourniquet is occasionally applied in a moderate state of tension, with the view of weakening, not suppressing, the current of blood in a limb. The common one, however, does not accomplish this object advantageously, because, by retarding the return of blood through the veins, it has the effect of rendering the arteries more charged with blood, consequently, any that are wounded more likely to bleed. In cases of anuerisms, where this plan is sometimes practised, the compression of the veins does infinite harm, by augmenting the œdema, and painful tension, so frequently attendant on that disease.

2. LIGATURE.

The most important of the means which has a permanent effect in the stoppage of bleeding, by producing a closure of the wounded vessels, is the ligature, by which the most alarming bleedings may be restrained. With this, the mouths of the divided arteries are tied, and thus, not only an instantaneous stop is put to further hemorrhage, but, long before the ligature becomes loose, the opposite sides of the vessels have generally grown together, and all danger of the renewal of the bleeding is over.

Several of the conclusions, drawn from Dr. Jones's experiments upon the subject of hemorrhage, are of the highest importance, in relation to the practice of surgery, and, were they all of them universally admitted, little doubt would remain about the most advantageous manner of making and applying ligatures. That a ligature, especially a small one, when applied round an artery with a proper degree of tightness, cuts completely through the inner coats of the vessel, is a fact which is now acknowledged by all the best-informed writers on surgery, whatever may be their sentiments about other contested points in regard to the best mode of tying arteries. But whether we should employ such ligatures, as are expressly calculated to produce this effect, and whether we should aim at it, as a beneficial and useful, not to say an essential, object, are questions on which the greatest authorities are yet divided. From a variety of experiments, Dr. Jones was led to infer, that the division of the membranous and muscular coats of a tied artery by the ligature had a principal share in bringing on the effusion of coagulating lymph within the vessel, or, in other words, the process of adhesive inflammation, by which the permanent closure of the vessel was effected. He observes, that when a ligature is properly applied, it cuts through the internal and middle coats of the artery, keeps their cut surfaces in contact, and affords them an opportunity of uniting and cicatrizing, as other cut surfaces do, by the adhesive inflammation. Nay, he extended the doctrine further, by representing the division of internal coats of the vessel by the ligature, not merely as advantageous, but as absolutely indispensable; for he remarks, that if the ligature does not completely cut through the internal and middle coats, all round the artery, adhesion cannot take place between its internal surfaces, and, therefore, secondary hemorrhage will take place as soon as the ligature has ulcerated through any part of the artery.*

That Dr. Jones erred in describing the division of the inner coats of the vessel as a thing, without which the vessel could not be closed by the process of adhesive inflammation, remains no longer questionable. The assertion, as Mr. Crampton † has observed, rested upon no other foundation, than several experiments, made on the arteries of quadrupeds, in *all of which* the internal and middle coats were ruptured by the application of the ligature. No comparative experiments are related in order to shew, that this operation of the ligature is essential to the process of union, and that, under these circumstances only, the obliteration of the artery can take place. Numerous instances are recorded of arteries being obliterated by the pressure of tumours. The subclavian and carotid have been found obliterated by the pressure of an aneurism of the arch of the aorta.* In Mr. Freer's experiments, the pressure of a tourniquet for four days was sufficient to effect the obliteration of the radial artery in horses.† Mr. Hunter observed, that in dogs, the mere exposure of the tibial artery to the air for about an hour, excited such a degree of inflammation and thickening of its coats, as completely obstructed the canal.‡ All the great arteries, the aorta inclusive, have been found obliterated, in consequence of the effusion of lymph from their internal coat, and this independently of any injury which could produce the rupture of that membrane. The cure of aneurism by compression (whether mediate or immediate) affords an example of the obliteration of an artery without any rupture of its internal coats.||

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* On Hemorrhage, p. 166. and 170.

† Medico-Chir. Trans. vol. vii. p. 343.

In the course of the interesting experiments undertaken by the late Dr. Jones, he found, that when a ligature is tightly applied round a large unwounded artery in a quadruped, so as to cut through the internal coats, and it is immediately afterwards removed, the adhesive inflammation takes place at the part of the vessel, embraced by the ligature, and the canal of the artery becomes permanently obliterated for some extent. This consequence happened, however, with increased certainty, when two or more ligatures were thus applied near each other, and then taken off.¶

The promulgation of these observations at first excited hopes, that the leaving of a ligature, on arteries, tied for the cure of aneurisms, might be dispensed with; and what Dr. Jones had himself succeeded in accomplishing, did not fail to convince him still more firmly, that the division of the inner coats of the artery was the main exciting cause of the adhesive inflammation, by which the canal of the vessel was permanently closed; and that the obliteration could not happen unless those coats were cut through by the ligature. But, as Mr. Travers has observed, the result of these experiments neither warranted the conclusion, that the complete division of the internal coat was necessary to union, nor that union was a necessary consequence of it. The history of the broad tape, or riband ligature, proves, that contact without wound will sometimes produce adhesion, and the frequent repetition of Jones's

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* Hodgson on the Diseases of Arteries and Veins, p. 110. A. Cooper in Med. Chir. Trans. vol. i. p. 12.

† Obs. on Aneurism, p. 14.

‡ On the Blood, &c.

|| Crampton in Med. Chir. Trans. vol. vii. p. 545.

¶ Jones on Hemorrhage, p. 126, &c.

experiment has proved, that wound without contact will often fail to produce it. Mr. Dalrymple of Norwich repeated the second experiment in Dr. Jones's third chapter, not less than seven times on horses, and three times on sheep, and in every instance failed in obtaining the same results as Dr. Jones. Not only was no coagulum formed, but, even when the animal had been suffered to live until the thirteenth, fifteenth, or eighteenth day after the operation, the canal of the artery was not found obliterated. Its calibre was indeed contracted; but the tube remained in some degree pervious, and capable of transmitting a lessened column of blood.* The evidence of another eminent writer also coincides precisely with that of Mr. Dalrymple.†

Dr. Jones's idea, that the division of the internal coats was essential to the production of the requisite degree of adhesive inflammation for the obliteration of the cavity of the artery, is completely refuted, not only by the facts adverted to by the preceding authors, but by a variety of other considerations. A ligature was put round the carotid of a dog without being drawn. It lay in contact with the artery, but did not press upon it, nor interrupt the flow of blood through it. The result was an obliteration of that part of the vessel which was irritated by the presence of the ligature. The same experiment was made on the carotid of an ass with a similar consequence‡. Here then we have further proofs, as unequivocal as any of those previously cited from Mr. Crampton's valuable paper, that the internal coat of an artery will effuse coagulating lymph when any cause of sufficient irritation exists on the outside of the vessel, and that the division of its inner coats by a ligature is by no means essential to the excitement of the adhesive inflammation within it.§

As Scarpa remarks, all parts which resemble each other, and especially serous membranes, including the inner coat of the arteries, when kept in close contact in sufficiently vigorous subjects, generally assume with surprising quickness the adhesive inflammation in the seat of the compression, and around it, evincing a singular propensity to effuse coagulating lymph, and, though such membranes are inflamed, they remain free from all ulceration, or breach of continuity. This is daily seen between the lungs and pleura, between the peritoneum and the viscera of the abdomen, and between the tunica vaginalis and the testicle. And, in order to assure ourselves that the same phenomenon also happens betwixt the two opposite sides of an artery, which are simply held in close contact with each other, without any previous ulceration, or rupture of them, we need not have recourse to analogy in what takes place under the same circumstances in other similar parts of the body, since there are numerous instances of the quick union and perfect closure of an artery, by means of the adhesive inflammation, under simple compression alone, practised upon the artery while all its parts remain entire. Dubois * effected this prompt adhesion by means of the serrenoeud of Desault; Assalini †, by compressing the artery with his forceps; and Crampton with a presse-artère, resembling that of Deschamps. To these facts, we are to add numerous others of the closure of the artery, in consequence of pressure made on the vessel by a neighbouring tumour, or an aneurismal sac. If the ligature were absolutely preferred to compression, in the treatment of external aneurism, still it would be certain, that by means of pressure, applied above the seat of the disease, several cures have been accomplished; and if the compressing apparatus does not always produce such good effects, it is often because we have not the opportunity of making the pressure with sufficient steadiness and force to obliterate the artery. Compression (says Scarpa) generally answers very well when made upon an exposed artery, behind which there is a point of resistance. Formy ‡, in a wound of the brachial artery, laid bare the vessel, placed a cylinder of linen upon it, and over this some graduated compresses, supported by means of a suitable bandage; and thus he effected the closure of the artery §. Guattani, exposed the femoral artery as it passes under Poupart's ligament, compressed it against the ramus of the os pubis with graduated little bolsters and a bandage, and the vessel was speedily closed. Flajani ||, in similar cases, found the same method answer. Buzani ¶, also succeeded with graduated compresses in healing a wound of the brachial artery, after bleeding; and so did Garneri in two additional examples of the same nature. Scarpa corroborates the purport of these observations by a relation of some experiments, in which the arteries of sheep and other quadrupeds were tied with a simple ligature, and also with a ligature between which and the vessels a roll of waxed linen was placed, in order to prevent the inner coats from being cut through. The main result was, that, in all these cases, the artery closed, but the ulceration advanced more quickly in the instances where the simple ligature was ** used. Four cases are likewise recorded, in which Scarpa's mode of applying the ligature was successfully practised in operations for aneurism. Some other experiments performed by Mislei, and introduced at the conclusion of Scarpa's memoir, I shall notice in

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* Travers in Med. Chir. Trans. vol. iv. p. 442.

† Hodgson on Diseases of Arteries, &c. p. 228.

‡ C. Bell, Surgical Obs. vol. i. p. 261.

§ See also Crampton's Experiments with a flat ligature, and piece of metal, on the carotids of sheep, in Med. Chir. Trans. vol. vii. p. 346., and other experiments detailed by Scarpa in his Memoria sulla Legatura delle principali Arterie degli Arti, &c. Fol. Pavia, 1817. p. 34. et seq.

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* Leveillé Nouvelle Doctrine Chir. t. iv. p. 247—280.

† Manuale di Chirurgia.

‡ Traité Chir. des Bandes Larges Emplâtres, &c. Montpelier, 1652.

§ De Aneurysmate, Historia 15.

|| Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. p. 47, &c.

¶ Opere di Bertrandi. Trattato dell Operaz. t. iii. p. 207. Gli editori.

** Memoria sulla Legatura, &c. p. 27. 34., &c.

the chapter on aneurism, to the treatment of which disease they more particularly refer.

The foregoing considerations cannot allow us to hesitate a moment about the rejection of Dr. Jones's assertion, that a ligature will never be followed by an efficient degree of adhesive inflammation within a tied artery, unless the inner coats of the vessel be divided by the cord. Instead of this sweeping inference, Dr. Jones should merely have concluded, that such inflammation may take place, after the ligature has had the effect described, and not that it cannot happen under any other circumstances. The determination of this question, however, is not at all a decision of the other point, viz. whether such division of the inner coats of an artery by the ligature be useful, or detrimental, in its effects upon the process, by which the vessel is to be obliterated. This is an investigation of greater difficulty, and one, concerning which very opposite sentiments prevail.

Dr. Jones, who considered such division as the best means of promoting the effusion of coagulating lymph within the vessel, and as the surest and most prompt mode of bringing about the union and closure of the tied part of the arterial canal, gave a decided preference to small ligatures, which always cut through the inner coats of the vessel with the greatest certainty.

He thinks, that ligatures should be round, and very firm; and he declares, that there is no danger of their making the external coat of the artery ulcerate, by their tightness, before the internal ones have adhered; for the union of the latter is found to be soon affected.

Dr. Jones reprobates broad, flat ligatures, because they cannot be tied smoothly round the artery, which must become puckered, and, consequently, have an irregular bruised wound made in its middle and internal coats. By covering a considerable part of the external surface of the artery, they may also destroy the very vessels which pass on it in their way to the cut surfaces of the internal and middle coats, and thereby render them incapable of inflaming. But, says Dr. Jones, admitting that such a ligature makes a proper wound, and that the wound unites, still it may cover that part of the external coat which is directly over the newly united part, and, consequently, as soon as it has occasioned ulceration through the external coat, it will produce the same effect on the newly united parts, and, of course, secondary hemorrhage.

A ligature of an irregular form will not cut through the inner coats of the artery equally at every point, which Dr. Jones endeavours to prove ought to be done, with a view of occasioning an effusion of lymph, and adhesion.

Dr. Jones has also explained the advantages of applying ligatures in as circular a manner as possible; not higher on one side of the vessel, than the other. Any deviation from a circle must be unfavourable to a steady apposition of the cut surfaces of the artery, and be conducive to secondary hemorrhage.

Mr. Crampton, however, is far from admitting the utility of cutting through the internal coats of the artery with the ligature, and is of opinion, that, in man, the division of these coats not unfrequently prevents the obliteration of the artery, and gives rise to secondary hemorrhage; two assertions which appear to me not to be very well proved. If it be meant to draw a weighty argument from the weakening of the artery by this effect of the ligature, and an apprehension of the vessel bursting, or becoming dilated, how can we give such importance to this mode of reasoning, when such inability of the remaining external coat to resist the impetus of the circulation must be very rare? Although the two middle coats are divided by the ligature in securing the vessels in the common way after every operation, I have never seen an artery give way, or become dilated from this sort of cause. I have known the ligature slip from not having been skilfully applied; I have known it accidentally pulled off by a jerk of the hand, and hemorrhage take place. I can even suppose, that an artery may be so forcibly tied as actually to produce a direct laceration of the external coat; but then the cause would rather be owing to the operator himself, than to any fault of his ligature. An artery may also be in so diseased a state as to give way at once under the application of the ligature; or if it should not burst so immediately, yet from being incapable of the adhesive inflammation, it may afterwards pour out its blood as soon as the ligature has produced ulceration through the external coat. But, in this circumstance, it is evident, as Scarpa himself allows *, that no mode of tying the vessel will answer. As we are not sufficiently acquainted with the actual state of the vessels, the kind of ligatures employed, and some other essential particulars, in the few cases cited by Mr. Crampton, with a view of proving the risk of arteries giving way from their inner coats being cut through by the cord, we cannot pronounce whether these were really examples of this injurious operation of the ligature; or whether they might not rather be specimens of some uncommon diseased state of the arteries. For my own part, I cannot suppose any instance, in which the brachial artery, after being tied in amputation, would three times form an aneurismal tumour above the ligatures † if it were not in some unusual state of disease, because I have seen hundreds of amputations, but have never witnessed such an occurrence. Besides, if this particular case prove any thing, it proves, at all events, that the largish ligatures used in Mr. Warner's time, which ligatures probably never fairly divided the inner coats of a sound artery, could not prevent the vessel in question from giving way. Without extending these criticisms, however, I may safely assert, that the advocates for the utility of cutting through the inner coats of the vessel, and the employment of small fine ligatures, will come off triumphantly,

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* Memoria sulla Legatura delle Principali Arterie, p. 7.

† See Warner's Cases in Surgery, p. 138. Probably the inner coats of the artery were in this case not divided, because the vessel was secured with a needle and ligature, and of course an intervening portion of flesh included. Mr. Warner himself entitles the case "An *Extraordinary* Disease of the Humeral Artery."

if they only encounter such objections as are founded upon the danger of the artery at once giving way, or forming an aneurismal tumour. It avails little to talk, as Scarpa has done, of the arteries of some individuals being of preternaturally weak texture from birth *, or to urge with Mr. C. Bell, that, if a dead artery be tied too tightly, it will burst at the tied part when distended with anatomical † injection. The question can never be decided by such statements; and when we admit with these writers, that an artery with three unbroken coats is physically stronger, than when two of these coats are broken, or torn, we still maintain, that the remaining external coat is strong enough to resist the impetus of the circulation, as far as we can judge from the general result of the practice, in which it is the surgeon's particular aim to cut through the inner coats of arteries in applying the ligature. It matters not what happens in the injection of dead bodies; what happens in aneurismal and diseased arteries before the ligature is employed; what may have happened in very unusual cases, showing that ligatures are not infallible; it must yet be proved, that the tying of arteries, on the principles recommended by Dr. Jones, is generally less successful than other plans.

Amongst the most distinguished surgeons, who oppose the doctrines and practice recommended by Dr. Jones, and so extensively approved of in this country, is Scarpa, whose valuable observations on many parts of anatomy and surgery render him the pride of the modern Italian school. After briefly describing the process of obliteration, according to Dr. Jones's account, and mentioning a few other things, to which I have already adverted, he argues, that as cutting through the internal coats of an artery must render the vessel weaker, than when its coats are left undivided, and we can never estimate the density of such a vessel in the living subject, it is cæteris paribus better to tie the vessel in such a way as will leave all its three coats uninjured. When the internal coat is ulcerated from internal causes, and the adhesive inflammation does not supervene quickly enough, he says, the blood is invariably effused through the layers of the middle tunic, and extravasated on the outside of it; first in the form of ecchymosis, and afterwards in that of an aneurismal swelling. Now, if this can happen, when only the inner coat is ulcerated, it must still more easily take place, when the middle coat is also divided, and any cause retards the adhesive inflammation. He admits that, even in this second case, if, directly after the division of the two internal coats, the artery is affected with the requisite degree of adhesive inflammation, as fortunately mostly happens, the union and closure of the vessel follow as speedily and favourably as if the two inner coats had not been divided. But he declares, that this fortunate issue is not constant, especially in man,

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* Memoria sulla Legatura delle Principali Arterie degli Arti, p. 25.

† Surgical Obs. vol. i. p. 260.

in whom the adhesive inflammation is not, as it is in brutes, sufficiently quick to produce on the coats of the artery its beneficial effects, immediately after the application of a tight ligature. Yet, while the adhesive inflammation is thus retarded, the ulcerative process occasioned by the pressure of the small ligature, rapidly attacks the external cellular coat of the artery, eats more and more deeply into it, and penetrates into the cavity of the vessel before this has been rendered impervious, and certainly with greater celerity, than if it had to make its way through all the three tunics of which the artery is composed. The slow access of the adhesive inflammation, whether from the general debility of the patient, or from the particular state of the artery itself, is not followed by a proportionate retardation of ulceration, which incessantly proceeds till it gives rise to the worst effects. Besides, if in feeble subjects the adhesive inflammation were not materially impeded, the coagulating lymph effused in the cavity of the artery, as well as the coagulum itself, sometimes does not acquire with equal celerity the degree of consistence necessary for firmly connecting together the opposite sides of the artery, which are held in accurate contact. These dangers, says Scarpa, are unquestionably avoided by keeping all the three coats of the tied artery from being injured by the pressure of the ligature. *

But, after all this reasoning, we must return to experience; and if Mr. Crampton and Professor Scarpa have produced cases, exemplifying the possibility of effecting the obliteration of arteries, without a division of the inner coats of the vessels, as I admit has been fully proved, they cannot subvert the fact, acknowledged by all the most experienced surgeons in this metropolis, that since Dr. Jones's principles have been acted upon in practice, and small ligatures been employed for securing bleeding and aneurismal arteries, cases of secondary hemorrhage have become much less common. Those principles dictate the use of a fine ligature, and prohibit all unnecessary disturbance and irritation of the artery; all needless separation of it from its surrounding connexions; and, in particular, forbid the introduction of a larger quantity of extraneous substances into the wound, than the indications positively require. If the increased success, to which I have alluded, be the truth, it is an answer to every argument used by the opponents of Dr. Jones's principles. With respect to the danger of the external coat being ulcerated through more quickly by a ligature, which divides the other two coats, as this occurrence will enable the surgeon to remove the extraneous substance sooner, it must be a great advantage, if it be also a fact, as experience proves, that such division of the inner coats expedites the adhesive inflammation, and insures the closure of the vessel, before the ulceration has penetrated through the external tunic.

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* Memoria sulla Legatura delle Principali Arterie, p. 26—28.

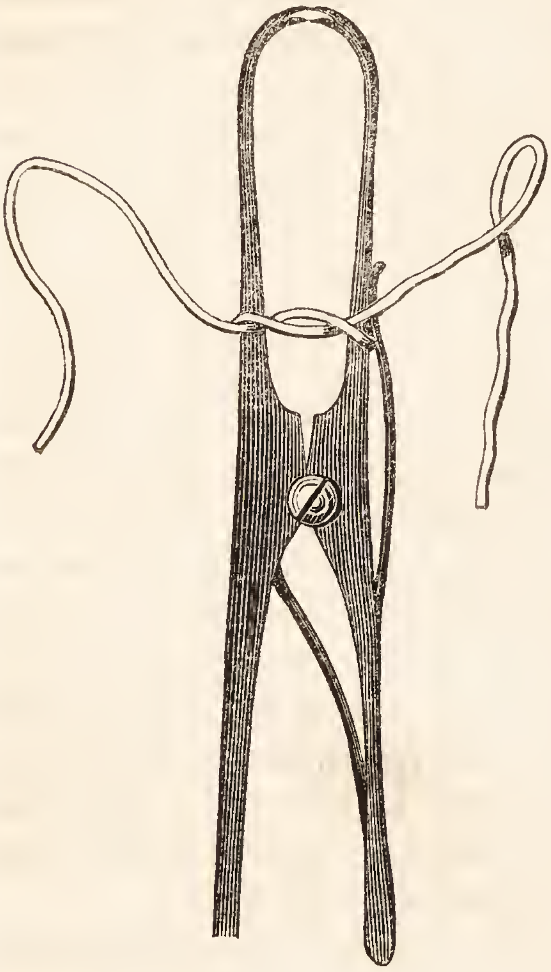
Dr. Jones refutes the idea of the impulse of the circulation making the ligature slip off; a fear which has led to very hurtful practices; with the view of mechanically fixing the ligature; and he observes, that a candid inquirer into the cause of it will find a much more rational explanation, either in the clumsiness of the ligature, which prevented its lying compactly and securely round the artery; or in its not having been applied tight enough, lest it should cut through the coats of the artery too soon; or in its having that very insecure hold of the vessel, which the deviation from the circular application must necessarily occasion.

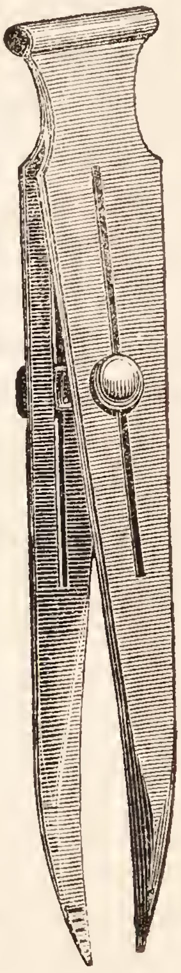
No other plan of preventing bleeding from large arteries is so safe as the ligature, because no other makes such direct pressure on them, nor acts with so little chance of being displaced. In the performance of operations, large arteries are often wounded in situations, where the tourniquet cannot be applied. The scientific surgeon now knows that he can tie such vessels immediately they are wounded, and then proceed with his incisions, without that confusion and danger which would result from the continuance of a profuse hemorrhage during the whole time requisite for the completion of the operation.

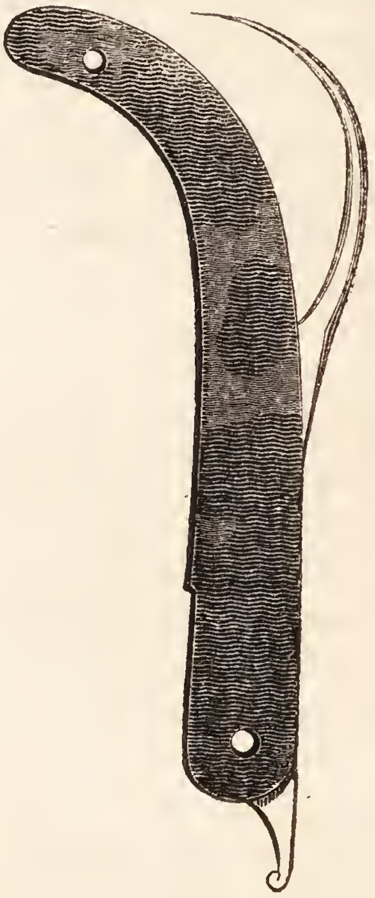
Good surgeons always endeavour to tie arteries as separately as possible, that is to say, without any nerve, vein, or portion of flesh being included in the noose of the ligature. The tying of the flesh should constantly be avoided when possible, because it produces immense pain and causes a larger part of the wound to remain disunited. Ligatures, thus awkwardly applied, are likely to become loose, as soon as the substance between them and the arteries sloughs; or they may form a circular furrow in the flesh surrounding the vessels, and remain a tedious time, incapable of being removed. The intervention of any substance, between the ligature and the artery, must also have a greater tendency to prevent the internal coats of the vessel from being cut through; that very event, on which the safety from secondary hemorrhage is found so much to depend.

Blood-vessels partake of the same organization as other parts. Hence the healing of a wounded artery can only take place favourably, when that part of the vessel, which is immediately contiguous to the ligature, continues to receive a due supply of blood through its vasa vasorum. As these vessels are derived from the surrounding ramifications, it is obvious, that the application of a ligature, to a divided artery, at some distance, from where it is encompassed by flesh, must be very disadvantageous and insecure. Thus, although it is quite improper to include much of the adjacent flesh with the artery in the ligature, it is highly judicious to make the knot as closely as possible to that part of the vessel, which lies undisturbed among its natural connections. These observations, however, only refer to vessels above a certain size; for others are not sufficiently visible to be tied in this manner

The method of tying an artery is as follows: the extremity of the vessel is first to be taken hold of by the surgeon, with a tenaculum, or pair of artery forceps, which open by their own elasticity, and admit of being kept closely shut with a double button, that slides along a slit in each branch of the instrument. The forceps is used only when the vessel is large and obvious. A round firm ligature, and by no means too thick, is then to be put by an assistant in the form of a noose, round the artery, just below the end of the instrument. The same assistant then tightens the noose; and, in order that it may not rise above the mouth of the artery, he draws the ends of the ligature as horizontally as possible, which can be done best with the thumbs. A knot is next made. Assalini's very ingenious tenaculum would be found exceedingly useful in cases where the surgeon has no assistant at hand.







When the wounded artery is large, one ligature to the orifice nearest the heart frequently will not suffice; for, as soon as this is tied, the blood finds its way, through anastomosing branches, into the lower continuation of the vessel, the further orifice of which from the heart then begins to bleed.

When a large artery is only punctured, and not completely cut through, the vessel is to be first exposed by an incision, and a double ligature then be put under it by means of an aneurism needle. One portion of the ligature is then to be applied above the wound in the artery, the other below it. Thus all danger of bleeding, from the blood's passage by the anastomoses into the lower part of the vessel, is effectually removed.

Sometimes, when the punctured part of the artery cannot be prudently exposed by an incision, the surgeon should cut down to the vessel in a situation nearer the heart, and be content with the application of one ligature. *

Since ligatures act as extraneous substances, and only one half of each is necessary for withdrawing it when it becomes loose, the other half is always to be cut off near the knot.

With the view of diminishing still further the quantity of extraneous substance in the wound, the practice of cutting off both ends of the ligature close to the knot has been of late years partially adopted. By some practitioners, the method is intended to be applied to all cases in which ligatures are used, whether the wound admit of being immediately closed or not. Others think the practice advantageous only when the wound must inevitably suppurate; and they express fears of the inconveniences that might arise from the presence of the little bits of thread, which would be left in the part, if the wound were to be healed over them by the first intention.† The peculiarity in Mr. Lawrence's method, who is an advocate for this practice, even when the wound is to be immediately closed, consists in the use of extremely fine ligatures, made of dentists' silk.‡ The bits of silk are not absorbed; but generally remain for a time without irritation in the parts, included in minute cysts formed by the adhesive inflammation; or, they afterwards come out by exciting little suppurations on the surface of the cutis; or, when the wound does not directly unite, they come away with the discharge.

Ligatures usually separate, even from the largest arteries ever tied, in about a fortnight, and from smaller ones in the course of five or six days. When they continue attached beyond the usual period, it is proper to draw or rather twist them very gently every time the wound is dressed, so as to accelerate their separation.

3. COMPRESSION.

Formerly surgeons used to fill the cavities of wounds with lint, and then make pressure on the bleeding vessels, by applying a tight roller over the part. The moderns understand too well the utility of not allowing any extraneous substance to intervene between the opposite surfaces of a recent wound, to persist in this practice, except in a very few instances. They know, that the sides of the wound may be brought into contact, and that compression may yet be adopted, so as both to restrain particular hemorrhages, and rather promote than retard the union of the wound. When the

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* In a gunshot-wound, injuring the popliteal artery, I once took up the femoral artery, and the plan answered very effectually; but the safest general rule is undoubtedly to expose the wounded part of an artery, and tie it above and below the aperture, from which the blood issues.

† Guthrie on Gun-shot Wounds of the Extremities, p. 93. See also Cross's Obs. in Lond. Med. Repository, vol. vii. 363., and Gibson's Institutes, &c. of Surgery, vol. i. p. 72.

‡ Medico-Chir. Trans. vol. viii. p. 490.

blood does not issue from any distinct, large vessels, but from numerous small ones, compression is preferable to the ligature, the employment of which would render it necessary to tie the whole surface of the wound. In order to make effectual compression in this case, the opposite surfaces of the wound are to be brought into contact; compresses are then to be placed over it, and a roller applied with moderate tightness.

If compression can ever be safely practised in bleedings from large arteries, it is when these vessels run in the vicinity of a bone, against which they can be compressed. Bleedings from the radial and temporal arteries are cases of this kind. Compression is sometimes tried, when the brachial artery has been wounded in phlebotomy. Here it is occasionally tried, in preference to the ligature, because the latter cannot be employed without an operation to expose the artery. It is absurd to adopt compression, in this instance, with an idea that it effects a closure of the wound in the vessel without obliterating the arterial canal; and, consequently, with less chance of mortification from a deficiency of blood in the limb. Frequent dissections have proved, that whenever a large artery has been wounded and healed by pressure, the wound is never closed so as to leave the canal of the artery pervious. It is true, that Dr. Jones's experiments, as well as those of Beclard *, tend to show, that an artery, very partially divided, may heal and remain pervious; but this is not to be expected, when compression is employed.

When an artery of magnitude has received a small wound, and lies favourably for a trial of pressure, the following plan may be followed: I suppose the brachial artery to be the vessel.

A tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then a compress, shaped like a blunt cone, and formed of a series of compresses gradually increasing in size, is to be placed with its apex exactly over the wound in the artery. This graduated compress, as it is termed, is then to be bound on the part with a roller.

After relaxing the tourniquet, if no blood escape, the surgeon should feel the pulse at the wrist, in order to ascertain that the compression employed is not so powerful, as entirely to prevent the circulation. The arm is to be kept perfectly quiet in a sling; and in forty-eight hours, if no bleeding take place, there will be great reason to expect that the case will do well.

Plenk invented a tourniquet, well calculated to heal wounds of the brachial artery, and here represented:

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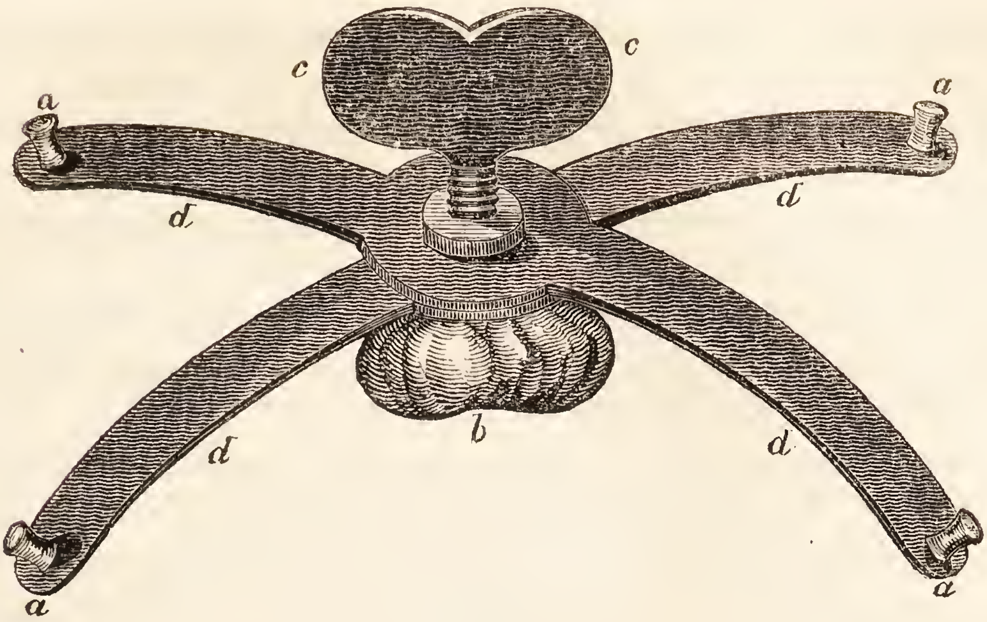
* Recherches et Expériences sur les Blessures des Artères.



Leather straps are attached to the buttons, *a*, *a*, *a*, *a*, and are fastened behind the arm with buckles; one above, the other below the elbow. The pad *b* is to be placed immediately over a graduated compress, which is to be put directly over the wound in the artery. The necessary degree of pressure may be regulated by the screw *c*; while the branches of the instrument, *d*, *d*, *d*, *d*, are at some distance from the limb, and consequently do not interrupt the flow of blood, either through the arteries or veins.

Compression of large arteries is never commendable, except in such a case as has been just mentioned, or when the wounded vessel is capable of being firmly compressed against an adjoining bone. The compresses sometimes slip off, or the bandages become slack, so as to give room for fatal hemorrhage. When the plan is employed, therefore, a slack tourniquet should always be left on the limb, ready to be tightened in an instant by a vigilant attendant left for that purpose. In this treatment, the external wound may heal, while the aperture in the artery remains unclosed, and an aneurism be the consequence, particularly if the pressure be not powerful enough; and when it is too great, mortification is liable to happen.

4. AGARIC,

Was formerly supposed to possess the virtue of stopping the most violent hemorrhage, without creating irritation. It has, however, no specific property of this kind; and whatever good effects it may seem to have had, are more properly ascribable to the compression adopted in conjunction with it. If it have any virtue at all, this is a mechanical one, arising from its soft, spongy texture, which qualifies it for filling up all inequalities in the wound, and thus closing the vessels. When it is considered that agaric is intended to be applied to the mouth of the bleeding vessel; and that, in this plan, the opposite surfaces of the wound cannot be brought into contact, we shall feel inclined to select some other means, not quite so repugnant to the union of the wound. Compression is often tried, because the vessel cannot be tied without an operation in order to expose it. But the employment of agaric is warranted by no such reason; for its fancied specific virtues require its application to be made directly to the divided artery. Agaric has also the inconvenience of acting as an extraneous substance in the wound, and, like compresses, it is liable to slip off the precise situation which it ought to occupy.

When the wounded vessel is large, surgeons should always prefer the ligature to agaric; and when smaller vessels bleed, compression is far preferable to it

These observations on agaric are also applicable to sponge. There are cases, however, in which it is impossible to tie, or compress the bleeding vessel; and improper to employ means which remain to be described. In bleedings from the rectum, and from the wound after lithotomy, the expanding quality of sponge often renders it exceedingly useful. The following means do not operate on the principle of pressure.

5. ACTUAL CAUTERY.

The application of a heated iron to a bleeding vessel is one of the most ancient modes of suppressing hemorrhage; but, at present, it is almost in general disuse. It operates by producing a slough, which covers and closes the mouth of the artery. In order that it may not injure the circumjacent parts, it is applied through a cannula.

There are several formidable objections to its employment: it does not regularly produce a permanent cessation of hemorrhage, as, when the eschar separates prematurely, the bleeding recurs. In many patients, the proposal excites horror; to all, the application is severely painful.

The only cases, in which the actual cautery is at all justifiable in modern practice, are hemorrhages situated in the mouth. *

6. POTENTIAL CAUTERY, OR CAUSTIC.

The most common formerly used, was a button of the sulphate of copper, of the size of a pea, rolled up in a piece of linen, and placed on the aperture of the bleeding vessel. The operation of strong caustics is similar to that of heated irons. Caustics are even worse than the actual cautery; for their action is more tedious, less effectual, and not confined to the vessel alone. In a case recorded by Pelletan, inflammation of the dura mater and death were produced by muriate of antimony applied to a bleeding tumour on the head. †

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* In Alibert's Nosologie Naturelle, tom. i., is related an amputation of the tongue, where the bleeding from three large arteries was instantly and effectually stopped by touching them with the cautery.

† Clinique Chirurgicale, tom. ii. p. 504.

7. STYPTICS, &c.

Styptics are alleged to have the property of producing a contraction of the vessels, and, as is sometimes erroneously supposed, a quick coagulation of the blood. Such are cold air, cold water, wine, brandy, tincture of myrrh, spirits in general, diluted mineral acids, solutions of alum, sulphate of copper, &c. These substances do, indeed, possess the power of stopping a few hemorrhages from small vessels; but, they ought never to be trusted, when large arteries are concerned.

The method of applying fluid applications of this kind is to dip lint in them, and place it on the bleeding surface. Compression is generally adopted at the same time.

That cold air has a styptic effect, we have the most unequivocal proofs. We frequently tie on the surface of a wound, every artery that betrays a disposition to bleed, as long as the wound continues exposed to the air. We bring the opposite sides of this wound into contact, and put the patient to bed. Not an hour elapses before the renewal of hemorrhage compels us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. I have repeatedly seen this happen in the scrotum, after the removal of the testis. The proper conduct in such cases is not to open the wound unnecessarily; but to apply cold wet linen to the part, and keep up a continual evaporation from its surface, by which means its temperature will be reduced, and the bleeding suppressed.

All styptics create great irritation in recent wounds, in which cases, therefore, scientific surgeons never have recourse to them. They are, however, judiciously used to suppress bleedings from many diseased surfaces, where the vessels seem to have lost their natural disposition to contract.

When an artery is partly cut through, it generally bleeds more profusely, than when quite divided, because it can neither shrink under the surrounding substance, nor contract itself sufficiently to become impervious. Hence originated the advice to divide some wounded arteries completely through. This plan, however, ought seldom to be practised; for, if the artery is large, a ligature must, after all, be applied both above and below the wound; and though it may answer when the vessel is of a moderate size, compression is safer. Were a large artery to be cut quite through, previously to the application of ligatures to it, its shrinking amongst the circumjacent parts would afterwards only increase the difficulty of tying it.

Sympathetic inflammatory fever, attended with an increase in the velocity of the circulating blood, and an augmented action of the heart and arteries, is the consequence of all considerable wounds. Hence, during its predominance, the patient is particularly exposed to the danger of fresh hemorrhage.

If the vessels be small, and the patient plethoric, venesection is sometimes recommended, the loss of venous blood being less prejudicial to the constitution than that of arterial. The flow of blood into the wounded limb is to be decreased by placing the part (if possible) in an elevated posture. Sometimes cold applications, sometimes compression, may be advantageously tried; while, in other instances, a tourniquet, so constructed as neither to stop the circulation in too great a degree, nor hinder the return of blood through the veins, would be exceedingly useful. If, however, the arteries should be above a certain size, and the hemorrhage still continue, the vessels must be exposed, and tied.

Hemorrhages from external injuries seldom require internal means, which, if they were needed, possess but questionable virtue. However, keeping the patient in a cool situation, not covered with too many clothes; enjoining him to avoid all motion and exertions, and allowing him only a very low diet, are undoubtedly means well calculated to lessen the chance of hemorrhage.

CHAP. XIV.

EXTRACTION OF FOREIGN BODIES FROM WOUNDS; UNION BY THE FIRST INTENTION, &c.

Besides hemorrhage, there is another circumstance which requires attention before the wound is dressed; namely, the removal of all extraneous substances from its surface. This is universally allowed to be an object of very material importance, because, if it be not fulfilled, the wound may be brought together as nicely, as accurately, and as skilfully as possible, and every thing look well at the beginning; yet, that desirable event, union by the first intention, will not follow, but, instead of it, a severe degree of pain, considerable swelling of the circumference of the injury, extensive redness, suppuration, large abscesses, and even the worst consequence, sloughing. All these aggravated effects frequently arise from the irritation of foreign bodies in wounds; and, as an incised wound can generally be examined, at first with the utmost facility, and properly cleaned, without putting the patient to much pain, the neglect on the part of the surgeon becomes the more blameable. In other deep, narrow, or lacerated wounds, and in many gunshot injuries, it is often difficult at first to ascertain whether there are extraneous substances in the flesh, or not; or when known to be there, their exact situation cannot always be determined; but, in open incised wounds, no such difficulty and obscurity prevail, and the surgeon who closes them, without having assured himself, that they are perfectly free from all extraneous matter, betrays either supine negligence, or an utter ignorance of his professional duty. It is true, an incised wound, made with a clean sharp instrument, which has not been broken, can have no foreign bodies in it; but very considerable and dangerous cuts are often produced by glass, china, &c., which break at the moment, and leave some of their fragments in the flesh. Sometimes, also, the weapon, with which the wound is made, is unclean, and, sometimes, dirt, gravel, &c. get into the wound, in consequence of the patient falling upon the ground immediately he receives the injury. I shall merely repeat, that, as extraneous bodies create serious irritation in every kind of wound in which they happen to be, the surgeon should always direct his attention to their removal as soon as the bleeding is stopped.

Mr. Hunter believed that blood, retaining the living principle, and lying on the surface of a wound, was rather useful than otherwise, in promoting the reunion of the parts; and it was his particular opinion, that effused blood became hurtful to this process, only after being deprived of the living principle by long exposure, the effect of styptics, &c. Yet, this is a doctrine which is by no means sanctioned by the best modern surgeons, all of whom are quite convinced, that leaving any blood upon the surface of a recent wound, when its opposite surfaces are to be brought together, is highly disadvantageous, retarding the cure, and rendering union by the first intention less certain. The presence of blood must have the effect of producing a greater or lesser separation of the opposite surfaces, which strictly ought to touch each other.

UNION BY THE FIRST INTENTION.

When the surgeon has stopped the bleeding, removed extraneous substances, and properly cleaned the wound, the next indication is to bring the opposite sides of the injury evenly into contact, and keep them quietly and steadily in this position, until they have grown together. Wounds may be healed by two processes, viz. by one, in which pus is produced, and granulations and new skin are formed; and by another, in which, if it perfectly succeed at every point, no suppuration whatsoever takes place. Surgeons have termed this way of healing wounds *union by the first intention, or adhesion*, and Mr. Hunter named the process by which it, together with many other analogous effects, is accomplished in the animal body, the *adhesive inflammation*.

The great recommendations of union by the first intention, are, celerity of cure; the hinderance of the pain and inflammation which would arise from the exposure of raw surfaces; freedom from the inconveniences of suppuration; the prevention of the deformity which would result from a large, irregular cicatrix; and the greater permanency and soundness of the cure, as the part is covered by the old, original skin, which is invariably stronger, and less disposed to ulceration, than what is new.

The strong tendency which divided parts of the animal body have to grow together, when kept a certain time in contact with each other, is an important fact, of which the moderns have taken much more advantage, than the ancients. In the treatment of ordinary injuries, the latter seem to have availed themselves little, or not at all, of this readiness of raw living surfaces to grow together; and, as we may see by referring to Celsus, it was principally in making attempts to repair and improve the appearance of deformed and mutilated parts, that they applied their knowledge of the fact to practice. The moderns, however, (I speak more particularly of our countrymen,) have shown their high sense of the good purposes to which this tendency to adhesion in the animal body may be converted, by recommending and practising the immediate closure of every wound, for the keeping of which open there is not some very particular and specific reason. There are even circumstances on record, leaving no doubt of the fact, that it is not quiet impossible for parts, entirely detached from the rest of the body, to become united again, if quickly replaced. One extraordinary case, generally quoted in confirmation of this stateiment, is that mentioned by Garengeot, where a soldier's nose was bit off, yet on being immediately restored to its natural situation, it acquired there a permanent union.* Two other examples of the re-union of pieces of the nose, which were entirely cut off, are recorded by Fioraventi †, and Blegny ‡; and well authenticated cases of similar facts in relation to other parts, may be found in different publications.§ The celebrated experiments of Duhamel and Mr. Hunter, furnish also a mass of interesting evidence, completely displaying the possibility of reuniting some parts, which have been recently severed from the rest of the body. It was proved by Mr. Hunter, that the testicles of a cock, when introduced into the abdomen of a hen, contracted a vascular connection with the surface of the viscera, and lived; and that a sound tooth might be transplanted from its socket, and acquire an union in the alveolary process of another person. Lastly, he repeated Duhamel's experiment, he cut off the spurs of a young cock, and found that they might be made to unite to its comb, or that of another cock, and grow even to a larger size than natural, in such situations. The possibility of this species of union shows how strong the disposition of the surfaces of a fresh wound must be to grow together; particularly when it is reflected, that, in the foregoing instances, there can be, on one side, no assistance given to the union, as the separated part is hardly able to do more than preserve its own living principle, and (as Hunter expresses himself), accept of the union.*

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* Traité des Opérations, t. iii. p. 55.

† Secreti Medicinali, 12mo. Venet. 1561.

‡ Zodiacus Medico-Gallicus, Mars, 1680.

§ Bossu, in Journ. de Médecine, t. xxxiii. Dr. W. Balfour's Obs. on Adhesion, with two Cases demonstrative of the Powers of Nature to reunite Parts which have been by Accident totally separated from the Animal System, 8vo. Edinb. 1814.

But, although this evidence is too strong to permit us to doubt the possibility of reuniting parts, which have been completely separated from the animal system, and in which the circulation of the blood has necessarily ceased for a time, it must not be dissembled, that attempts of this nature have generally failed. They are very successful, however, when the detached part still retains a partial and slight connection with the rest of the body, by means of only a few fibres, or a little bit of skin: a circumstance that makes a very material difference. As † Dr. Thomson has said, many cases are upon record, and many more have been observed, in which parts have been reunited which were completely detached, with the exception of a very small portion of cutis, a portion so small, that it is not easy to conceive, that any effectual circulation could be carried on through it; and he quotes from Arcæus an instance in which the nose, and most of the upper jaw, were so extensively separated, as to hang down upon the chin, and yet were afterwards reunited. A remarkable example of the same kind was published by Larrey ‡, one of whose assistants was actually about to cut through the connection which was left, when he was interrupted by the Baron, who happened to be on the spot. The instances, in which the fingers, toes, nose, and ears have been entirely cut off, with the exception of a small bit of skin, and afterwards saved by adhesion, are so generally known, and frequently exempified in practice, that it would be useless prolixity to dwell upon them.

The knowledge of the preceding facts cannot but prove useful in relation to surgery: it raises our confidence in the powers of nature, under circumstances in which we should otherwise entirely despair; and, with the precedents before us, we shall be induced to attempt the union of parts, and, sometimes succeed, when the project would appear hopeless and absurd to any one uninformed of what has already happened in other similar cases.

In promoting union by the first intention, surgery is merely to officiate as the handmaid of nature. There are only two indications: the first is, to bring the edges of the wound accurately together, and keep them so; the other is, to endeavour to avert violent inflammation, by which the agglutination of the wound would certainly be prevented. The first object is accomplished by a proper position of the wounded part, and by the use of bandages, adhesive plaster, and sutures; the second is fulfilled by a strict observance of the antiphlogistic regimen, and particularly by avoiding every kind of motion and disturbance of the wound. The rest is the work of nature.

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* See Hunter on the Blood, &c. p. 208., and Duhamel in Mém. de l'Acad. des Sciences, 1746.

† Lectures on Inflammation, p. 245.

‡ Mém. de Chir. Militaire, t. iv. p. 20. 8vo. Paris, 1817.

1. POSITION OF THE PART.

This is to be regulated on the principle of relaxing the wounded integuments and muscles. If the extensor muscles are injured, the joints which they move ought to he placed in an extended posture; if the flexor muscles are wounded, the limb is to be bent. When the integuments alone are cut, the same posture which relaxes the muscles situated immediately beneath the wound, also serves in general to relax the skin. In transverse wounds of muscular fibres, it is astonishing what immense effect a proper posture produces. This is never to be neglected, whatever may be the other means adopted.

2. BANDAGES.

Bandages may frequently contribute very essentially to keep the sides of the wounds duly in contact, as is strikingly illustrated in cases of harelip, where the opposite edges of the fissure may be brought forward so as to touch, and be maintained in this position by the simple use of compresses and a bandage. Such was the mode of treatment actually preferred by M. Louis; and, were it not for the greater convenience and certainty of the twisted suture, it is the plan to which surgeons would yet have recourse.

The common uniting bandage can only be applied to wounds which take a direction corresponding to the length of the body, or limbs, and which are situated where a bandage can be used with convenience and effect. It consists of a double-headed roller, with a slit between the two heads, large enough to allow one head of the roller to pass through it with facility. The proper dressings having been put on, the surgeon is to take one head of the roller in each hand, and apply the bandage first to that part of the limb which is opposite the wound. One head of the roller is then to be brought round, so as to bring the slit precisely over the breach of continuity. The other head is then to be brought round in the opposite direction, and passed through the fissure. The bandage is next to be drawn moderately tight, and its two heads being carried round the limb again, the same artifice is to be repeated. A sufficient number of turns of the roller must be made to cover the whole length of the wound. When the wound is deep, small longitudinal compresses are sometimes put under the roller, at a little distance from the edge of the wound.

As the uniting bandage can only be made use of for longitudinal wounds, which never have a considerable tendency to gape, nothing can be more absurd than the application of it with immoderate tightness. By this cruel and injudicious practice, many limbs and lives have been lost; for, if the bandage be very tight on its first application, what a dangerous constriction of the limb or part must follow, when the swelling, necessarily arising from the wound, has come on. It is thus, that insufferable pain and gangrenous mischief are frequently induced, when, if the part had been simply dressed, and left unconfined, every thing would have gone on most favourably. It is right to state, however, that modern surgeons are not partial to the uniting bandage, and I have no hesitation in saying, that it is a means which may be advantageously banished from practice. If it be true, that it brings the sides of deep wounds together better than adhesive plaster alone, and that it acts without the irritation arising from the application of resinous substances to the skin, it still has many inconveniences: its total concealment of the wound, its lying in irregular folds, so as to create an uneven cicatrix, the difficulty of undoing it, and some other serious objections, might be mentioned. These reasons have rendered its employment much less frequent than in former times, and, I may say, that its use in this country is now superseded by the preference universally and justly given either to a common roller or an eighteen-tailed bandage, in every sort of wound for which the old incarnative bandage. some years ago, used to be recommended.

3. ADHESIVE PLASTER,

Is erroneously set down in numerous surgical books, as being only applicable to superficial wounds of the skin. It is true, that it has no direct effect in bringing the edges of a deep, muscular wound together; but, let it be remembered, that while it proves effectual in maintaining the edges of the skin in contact, it presents no obstacle to the simultaneous adoption of a proper position, compresses, and bandages, means having more effect on the deeper part of the wound. It is also an error to suppose, that adhesive plaster cannot be used in situations where hair grows, or where the application is apt to become moistened. If the part be well shaved, and perfectly dried at first, the plaster will not become loose so soon as to prove ineffectual.

It is generally applied in strips, between every two of which an interspace is recommended to be left, for the purpose of allowing the discharge to escape, in the event of any part of the wound not healing in the ready manner which is desirable. Therefore, to bring the edges of the wound effectually together, and, at the same time, to leave a little room for the exit of the discharge, are the leading objects to which we ought to attend in using adhesive plaster. Hence, when the strips are broad, it is not unfrequent to cut out an oval piece of each strip, just where it crosses the wound.

Adhesive plaster is of great use, even in those wounds in which it is impossible to bring the edges into contact: by bringing and retaining the edges near each other, the strips lessen the size of the wound, while they keep surfaces in contact which have a disposition to adhere; and ultimately, when the gradual elongation of the old skin begins to take place, they succeed in bringing the separated edges together.*

A pledget of simple cerate is often applied over the plasters: it is frequently preferable to dry lint, which sticks to them and the ligatures, and is more troublesome to remove.

4. SUTURES.

Of the numerous sutures used by the old surgeons, only four are now ever employed: viz. the *interrupted*, the *quill*, the *twisted*, and another one, named *gastroraphe.* The twisted suture will be spoken of in the chapter on the harelip, and gastroraphe will be noticed in that on wounds of the abdomen.

INTERRUPTED SUTURE.

When the bleeding has been suppressed, and all extraneous substances have been removed, the surgeon is to place the limb in such a posture, as shall enable him to bring the lips of the wound easily into contact. The needle, armed with a ligature, and having a curvature that forms the segment of a circle, is then to be introduced into the right lip of the wound, at a small distance from its edge, and is to be directed across the bottom of the wound, so as to come through the left lip from within outward. It is now to be cut off, and the ligature tied in a bow. These sutures should always be, at least, an inch from each other. At the same time, strips of adhesive plaster, and a bandage for the support of the part, are usually employed.

QUILL SUTURE.

Formerly, this means of uniting wounds was often practised, when the muscles were deeply wounded, on the supposition that it produced a more perfect support of every part of the wound, than could be effected with the preceding suture. The same kind of needle is used as for the interrupted suture; but it must be armed with a double ligature. When the double ligatures have been introduced through the lips of the wound, at as many places as its length may require, their ends are to be separated, and then tied in a bow over a piece of bougie or quill, placed along each lip of the wound.

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* See Thomson on Inflammation, p. 293.

Dionis first reprobated this suture, which is justly rejected by the the moderns as an artifice of mere ingenuity, and no real utility. An account of its modifications, therefore, would be superfluous.

In the present schools of surgery, the use of sutures is less recommended than in former days. By the combined operation of position, adhesive plaster, and a bandage, almost all wounds are capable of being united as expeditiously, and well, as they could be, were sutures employed. In the cure of the harelip, and a few wounds of the face, and, perhaps, in the treatment of large wounds penetrating the abdomen, we must admit their utility. In wounds of the lips, the incessant and unavoidable motion of the parts; and, in those of the abdomen, the distention, arising from the viscera, and the danger of their being protruded, are reasons which, in these particular instances, may account for the advantages of sutures. But, in general, the promotion of union by the first intention cannot be set forth as a valid argument, in favour of the practice. Inflammation, above a very moderate pitch, always destroys every prospect of this nature, and occasions the secretion of pus, instead of the exudation of coagulating lymph. Sutures have fallen into disrepute, principally because they tend to increase inflammation. The new wounds which they make, their irritation as extraneous bodies, the forcible manner in which they drag the living parts together, and their incapacity, in general, to accomplish any useful purpose, which position, adhesive plaster, and bandages, cannot effect, are strong motives for reprobating their common application. In fact, it often happens, when sutures are employed, that considerable inflammation of the wound is the consequence, and its swollen edges evince marks of suppuration, unless soon relieved from the irritation of the ligatures. Frequently, in this kind of case, if the surgeon be sagacious enough to cut the ligatures, and remove them in time, suppuration may still be avoided. Extensive erysipelatous redness, uncommon pain, and severe nervous symptoms, will often be found to originate from the irritation of sutures.

Pibrac's remarks on this subject are highly worthy of consideration: after relating many convincing facts, he concludes with asking, what practice the partizans of sutures would adopt, were they necessitated, as they frequently are, to cut the ligatures, and remove them? Or, were they to find, as is often the case, that the ligatures had made their way through the lips of the wound, so as to leave them gaping? They would then never think of introducing new sutures, but would have recourse to a bandage, in order to unite the wound.* Both this gentleman and †M. Louis urgently recommended the entire discontinuance of the practice, and their observations are accompanied by facts which must have considerable weight. Their arguments, I confess, made a deep impression upon myself; and if I cannot join in the sentiment, that sutures ought to be entirely abandoned, at all events, I believe that they are still a great deal too much used. Professor Thomson thinks sutures may be generally omitted, except in superficial wounds, which we wish to heal by the first intention, or in wounds where (as in those of the abdomen) it is necessary that the edges should not be allowed to separate from each other.‡ But hardly any two surgeons think exactly alike about the cases, in which sutures are truly beneficial or not. Thus, I do not admit that they ought to be used as frequently as the remarks of Dr. Thomson would warrant; and it seems to me, that the majority of superficial wounds, in which union by the first intention is indicated, so far from being examples in which sutures are necessary, are, of all cases, those which least require them. Were we to admit such as instances of the necessity for sutures, the practice would become as common again as ever it was in the less improved periods of surgical knowledge.

Such are the principal means for keeping the opposite surfaces of wounds in contact, until union has taken place. The first plasters and dressings should continue on the part at least three or four days, unless any disagreeable symptoms, as excessive pain, hemorrhage, &c. indicate the contrary. The cause of the severity of the pain should always be duly considered, and, if possible, removed: sometimes it is owing to the sutures; sometimes to the immoderate tightness of the roller; and, occasionally, to extraneous substances yet lodged in the wound.

When too much inflammation is apprehended, the bandage should never be tight; and wetting it with cold water may be of use. Perfect quietude, and an antiphlogistic regimen, should be observed. The old plan of covering the dressings with thick woollen rollers, caps, and large masses of tow, has now gone very much out of fashion, as being inconsistent with those principles which are recognized by every scientific surgeon, as best calculated to avert and lessen inflammation.

When the first dressings are removed, the surgeon often finds union by the first intention accomplished only at certain points of the injury; and the connection even there still requiring further support. On the application of the second dressings, however, it is generally unnecessary to put on as many strips of adhesive plaster as were at first employed, and their number may be gradually lessened at each future dressing. The sutures, if there are any, should also be now withdrawn, as they can do no further good, and their continuance may excite irritation, and do harm. Throughout the rest of the treatment, also, the dressings should be light, simple, and unirritating.

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* Sur l'Abus des Sutures, in Mém. de l'Acad. de Chirurgie, tom. iii. 4to. or tom. ix. 12mo.

† See Mémoire sur l'Opération du Bec-de-Lievre, op. cit. tom. xii. p. 118. edit. 12mo.

‡ Lectures on Inflammation, p. 287.

I shall conclude this chapter with a few useful rules, which Professor Thomson recommends to be observed in the dressing and examination of wounds.

The first is, never to give the patient more pain from our modes of procedure, or methods of dressing, than is absolutely necessary for his present good or future security. For instance, we ought never to probe a wound, where probing can be of no use; and we should be contented to remain ignorant of things, the knowledge of which would only gratify an idle curiosity.

Another good rule is to have all the fresh dressings perfectly ready, before the old ones are removed. A sponge and warm water, adhesive plaster, pledgets, lint, bandages, &c. should all be at hand, and not left to be looked for at the very moment when they are wanted.

As in many instances the removal of the dressings, and the application of others, take up a considerable time, we ought carefully to reflect what position will be most easy to the patient, and, at the same time, most convenient to the surgeon.

When the bandage, adhesive plaster, and other dressings, have become hard and dry, and glued together, and to the surrounding skin, by blood, or other discharge from the wound, the surgeon should soften and loosen the applications by wetting them a sufficient length of time with warm water, which is to be pressed out of a sponge upon them, a basin being held below the part for the reception of the water as it falls off the dressings. This duty is of much importance in saving the patient from a great deal of agony, which the abrupt removal of the adherent dressings would produce.

In removing the dressings which are under the bandage, we should be careful that the ligatures are not entangled, and forcibly pulled away, so as to give severe pain, and create a risk of hemorrhage.

The strips of adhesive plaster should be removed by taking hold of their ends, each of which is to be drawn towards the wound. Were the plasters pulled off in the contrary direction, the edges of the wound would be liable to be torn asunder again, and the process of reunion at all events disturbed: neither should the plasters be pulled up, as by this proceeding the edges of the wound would be torn from the subjacent parts.

In large wounds, only a single strip, or at most two, should be off at a time, and the part, from which the plaster has been removed, having been carefully wiped with a sponge and dried, is then to be supported with a fresh strip, before any more strips are taken off. As Dr. Thomson well observes, it is from inattention to this rule that wounds are daily torn open again at each dressing, merely by the weight of the parts.

The sides of the wound, particularly if it be large and deep, should always be supported by an assistant at the time of changing the dressings.

When there are several wounds, only one is to be opened and dressed at a time, so that all unnecessary exposure of the parts may be avoided.

At each dressing, care must be taken to prevent lodgments of matter, by placing the compresses and strips of plaster in the manner best calculated to press upon and obliterate any cavity, in which the pus has a tendency to accumulate.

The utmost attention should be paid to cleanliness, every thing filthy and offensive being removed from the ward as quickly as possible. Above all things, care must be taken not to let the matter touch the bed-clothes. In the military hospitals, the custom of laying a piece of oilskin under suppurating wounded parts, in order to keep the bed clean, is highly praiseworthy; for cleanliness is essential to the general health of the patients, and the favourable progress of wounds.

The frequency of dressing must be regulated by the quantity and quality of the discharge; by the situation of the injury; by the climate and season of the year; by the effects which the renewal of the dressing seems to produce; and by the feelings, and sometimes the wishes, of the patient.*

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* Thomson on Inflammation, p. 294, &c.

CHAP. XV.

PROCESS BY WHICH THE WOUND IS UNITED.

When the opposite sides of an incised wound are maintained in contact by the foregoing means, they soon become permanently connected together. The vessels of the wounded surface cease bleeding, and their extremities become impervious to the blood itself, but not to the coagulating lymph, which forms the general bond of union between living parts. This uniting medium is the primitive and most simple connection that takes place between the two sides of a wound. In many cases, where the wound is closed before the hemorrhage has had time to cease, no doubt a coagulum of blood itself constitutes the first bond of union, and wounds must thus be frequently united through the medium of red blood. I have, however, already explained, that the best practical surgeons make the surface of the wound as free from blood as possible, before its opposite sides are brought together, because it is found, that union by the first intention more certainly follows this mode of proceeding. But, the reader is not to understand, that he is to defer bringing the sides of a wound together, until every little oozing of blood is at an end; for the long exposure of the wounded surface would be very injurious, and tend to defeat the grand object in view, direct adhesion, without suppuration.

We have examples of an union, very similar to that by the first intention, in bones which have been fractured: in tendons which have been ruptured; and even sometimes in muscles which have been wholly or partially torn asunder, without any division having been produced in the skin which covers such parts. In the sudden and violent division of these textures, blood is always effused between the divided parts, and into the surrounding cellular membrane. When this extravasated blood is not very considerable in quantity, and when the parts from which it has been effused are not too severely injured, it is observed to be gradually absorbed, in proportion as the process of union advances. If the divided surfaces be examined a few hours after the accident, they will be found to be covered with coagulating lymph. This substance, indeed, appears to be effused very quickly after the injury. Professor Thompson found, that, in animals, a distinct layer of it was effused over their wounds in less than four hours.* But, says he, whatever may be the period at which it is first formed, it is now well ascertained, that, in healthy subjects, when fractured, torn, or ruptured surfaces, to which the external air has not been admitted, are properly covered with this layer of coagulating lymph, and kept in contact, they speedily coalesce, and that, by this lymph becoming a living intermedium, the continuity of the divided part is at length restored. Appearances, precisely similar to such as happen in divisions without communication with the external air, take place in simple incised wounds, the edges of which have been brought together before, or soon after the bleeding has ceased. If a wound of this kind be torn open soon after its reunion, the surfaces, which had been united, are seen covered with a substance resembling jelly, which is the coagulating lymph, or fibrin of the blood. By some it is supposed, as I have said, that this lymph is poured out from the smaller vessels which have been cut; but Professor Thomson inclines to the opinion, that it is chiefly, if not wholly, formed by the secreting action of the capillary vessels of the divided surfaces.*

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* On Inflammation, p. 209.

The simple agglutination of the sides of a wound together, is what may be considered as taking place directly they have been brought into contact. The next step, in the process of union by the first intention, is the generation of vessels in the coagulating lymph, or blood; and this is soon followed by an intercourse between the vessels of the two sides of the wound. The manner in which the new vessels arise in the uniting medium, as well as the way in which the inosculation of the divided vessels happens, are at present only matters of conjecture. I have introduced almost as much as is known upon this abstruse subject in the chapter on inflammation. Mr. Hunter once conceived that blood and coagulating lymph, as long as they retained the living principle, possessed the faculty of generating vessels within themselves, quite independently of any adjoining surfaces; and in the growth of the chick, there are unquestionably some appearances in favour of this opinion. This doctrine, however, he is said to have renounced previously to his death, and to have adopted the belief, which is now daily gaining ground, that the new vessels are extensions from the old ones. Professor Thomson delivers the following statement; the coagulating lymph, soon after its exudation, becomes penetrated with blood-vessels, *which proceed from the divided surfaces*, appear to join in the process of reunion by open extremities, or, in other words, to inosculate with one another. The blood now circulates freely through the new-formed channels of communication established between the vessels, which penetrate the lymph effused upon the surfaces formerly divided; and the vessels which shoot into the lymph, often acquire in the course of a few hours a size which renders them capable of being injected. The precise manner, in which the vessels are extended into the coagulating lymph, is still unknown. It has not been positively settled, whether it is the divided vessels which penetrate the lymph. The extremities of the larger branches are closed with the effused lymph, and removed by means of it and their natural elasticity to a distance from each other. Dr. Thomson regards these circumstances as insurmountable bars to their immediate inosculation; and he remarks, that, if it be the closed vessels which are prolonged into the lymph, each small artery must obviously have its corresponding vein. But, says he, the inosculation, or direct union of the small blood-vessels from the opposite surfaces of the wound, however difficult to conceive or explain, is a truth undeniably established.* He then adverts to Duhamel's experiment, which fully proves, that, in the reunion of parts which have been divided, the blood-vessels from the opposite surfaces inosculate directly, and do not merely pass one another. Duhamel broke the legs of six chickens, and, after the bones had reunited, he cut through about one-third of the soft parts, covering the callus, or new bone. When the wound had healed up, he divided another third part, and in the same manner the remaining third part, sparing neither blood-vessel, tendon, nor nerve. Only one of the six chickens survived these cruel operations; but, upon injecting the artery at the upper part of the thigh, the injection penetrated to the lowest part of the leg. "I cannot say (Duhamel remarks) whether the large vessels, filled by the injection, were dilated capillary vessels, or the large vessels of the leg, which had been reunited; but the experiment proves irrefragably the inosculation of the blood-vessels." Later observations than those of Duhamel (says Professor Thomson) have shewn, that it is by the small vessels, and not by the larger trunks, that the inosculations are formed, by which the divided parts of a limb are supplied with blood: nor does he accede upon this point to the sentiment of Hunter, who conceived that he had certainly succeeded in observing inosculation on the tunica conjunctiva of the eye, the vessels of which are frequently divided by surgeons in cases of ophthalmy. He states, that the two ends of the cut vessel are seen to shrink; but, after a little while, they are perceived to unite, and the circulation is carried on again.†

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* Op. cit. p. 210.

The celerity, with which the process of union by the first intention is completed, is a circumstance that must excite the admiration of the philosophical surgeon. In the short space of seventy-two hours, the wound, produced by amputation of the thigh, is often securely united through its whole extent, without any suppuration, except just where the ligatures are situated. Incised wounds of a moderate size may, in general, be completely healed by this method in forty-eight hours. How different, then, is the surgery of the present day to that of half a century ago, when the bigoted prejudices of our ancestors deterred them from doing, not only what was most salutary, but most simple! The complicated business of accomplishing digestion, incarnation, and cicatrization, is now reduced to the easy duty of bringing the sides of a clean cut wound into contact, and maintaining them so until they have grown together.

As a modern surgical writer has observed, "there is no wound, in which we may not try with perfect safety to procure this adhesion; for nothing surely can be more kindly when applied to a wounded surface, than the opposite surface of the same wound: it has been but just separated from the opposite surface: it may immediately adhere to it: though it do not adhere, no harm is done; still the wound will suppurate as kindly, as freely, as if it had been dressed with dry lint, or some vulnerary balsam, or acrid ointment. If only a part suppurate, while one-half, perhaps, adheres, then half our business is done: and, in short, this simple way of immediately closing a wound is both natural and safe."* If I were to instance any one circumstance, in which I think the excellence of English surgery strikingly displayed, I should be inclined to cite our partiality to the mode of curing wounds by the first intention. M. Roux†, in his criticisms upon this part of our practice, may convince his readers how sincerely he believes what he says; for he actually fancies we have been, as it were, forced into the custom of healing up wounds as quickly as we can, because, unfortunately, in this country, we have not, as he conceives, a sufficiency of the requisite materials for dressing wounds, which are to heal by suppuration! But, I doubt whether he will be joined by any surgeons on this side of the channel in the belief, that it would be better to abandon the practice of adhesion altogether, than make it an exclusive method of treatment. He particularly mentions the wound after castration as unfit for this plan, because the edges cannot be easily put into a state of co-aptation, unless a considerable piece of the scrotum be cut away, and sutures be used; and also because the closure of the wound is attended with a risk of a collection of blood taking place in its cavity, and nature is nearly as long in effecting a cure, when the sides of the wound have been brought together, as when they have not. But if the principle were to be admitted, that the possibility of bleeding within a wound is an adequate reason for filling it with charpie, and not attempting to heal it by the first intention, we ought to renounce this last beneficial practice in every instance, where the surface of the wound is extensive, and its cavity large, as after amputation, the removal of a breast, the extirpation of tumours, &c. But, even supposing the scrotum should sometimes become filled with coagulated blood, of which M. Roux is so much afraid, it may then be inquired, which of two patients would be the best circumstanced, one with the scrotum crammed with with charpie, or another with the same part distended with coagulated blood? Which will suffer least pain, have the most moderate suppuration, and get well in the shortest time? If the answer to these problems be so doubtful, as not to admit of being readily delivered, surely we may be allowed to argue thus: that if, when the evil complained of by M. Roux does really occur, the patient is not decidedly worse off than when such disaster does not happen, but the particular treatment recommended by that gentleman is followed, how much better it must be to let the patient at all events have the chance of a considerable portion of the wound uniting; for when this is accomplished, (to use Mr. John Bell's phrase,) half our business is done.

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* P. 212.

† On the Blood, p. 195.

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* Discourses on the Nature and Cure of Wounds, by John Bell, p. 14. edit. 3.

† Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p. 117. et suiv. 8vo. Paris, 1815.

But, if any wound require more strongly than others the approximation of its edges, and to be healed, if possible, by adhesion, it seems to me, that it is the incision made in the Hunterian operation for aneurism. Here the wound should be closed to let the artery lie quietly amongst its natural connexions, undisturbed by the contact of any dressings, or other extraneous substances, by which the adhesion of its sides might be prevented, its ulceration induced, and secondary hemorrhage occasioned. But, extraordinary as it may appear, this is another example of our practice selected by M. Roux to illustrate our blind predilection for healing wounds by the first intention. The wonder ceases, however, when we find that he considers ligatures of reserve (ligatures d'attente) advisable means in operations for aneurism; for they are undoubtedly awkward things in a wound which ought to be healed as quickly as possible, and they put union by the first intention out of the question. But, in London, where the inutility and dangers of these ligatures of reserve are well understood, a practice, which tends to abolish their use, will be welcomed, as bringing with it another high recommendation.

CHAP. XVI.

PUNCTURED WOUNDS

Are not only dangerous, on account of their frequently extending to a considerable depth, and injuring large blood-vessels, nerves, and viscera of importance, they are also dangerous, inasmuch as they frequently give rise to violent and extensive degrees of inflammation. It is not uncommon to see them followed by formidable collections of matter, especially when the instrument, with which they have been made, has penetrated deeply through an aponeurosis or fascia. The extension of inflammation along the continuous textures from the original seat of the puncture, and the formation of matter under the fasciæ, are two of the most remarkable local phenomena, which are particularly liable to arise from punctured wounds.* Stabs, and all other punctures, are not simple divisions of the fibres of the body: they are attended with more or less contusion and laceration. Hence, there is not the same readiness to unite, which we observe in wounds made with sharp cutting instruments; and when the weapon has entered deeply through ligamentous expansions, the inflammation excited often spreads very extensively, attended with most severe pain in the parts affected, great tension, swelling, and abscesses running under the fasciæ to an alarming extent. Violent symptomatic fever, and great agitation of the nervous system, indeed, often follow punctured wounds; effects, which have been attributed to the injury of tendons, or nerves. This doctrine, however, is now nearly exploded. Surgeons frequently see nerves of considerable size and large tendons wounded, without the occurrence of great constitutional disorder; therefore, it cannot be the mere injury of these parts which is the occasion of all the general indisposition.

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* Thomson Obs. made in the Military Hospitals in Belgium, p. 29. 8vo. Edinb, 1816.

More is to be feared, I think, from the frequent depth of a stab, or puncture; the roughness and violence with which the injury has been done; and the many different textures pierced; than from the circumstance of tendons, or nerves, happening to be wounded. Amongst the worst kinds of general indisposition, more frequently following punctured, than other descriptions of wounds, is tetanus; a complication, still oftener seen in warm climates, than our own.

Punctured wounds are generally more dangerous and difficult to cure, than cuts and sabre wounds, though much depends upon the nature of the parts injured. When immense swelling and inflammation follow; large abscesses form; extensive erysipelatous redness comes on; a large artery, or important viscus is wounded, and blood, or other fluid extravasated; the case is undoubtedly of a serious and dangerous nature. The same remark may be made when tetanus, or violent symptomatic fever, and great agitation of the nervous system, complicate the injury.

In the treatment of punctured wounds, erroneous suppositions have commonly led to many serious abuses. The unlimited idea, that the severe consequences of most punctured wounds are in a great measure owing to the narrowness of their orifices, induced numerous surgeons to practise, indiscriminately, deep and extensive incisions, for the purpose of rendering their external communication considerably wider. To have constantly in view the conversion of such injuries into simple incised wounds, was always a maxim strongly insisted upon, and urged as the reason for such treatment. The doctrine even occasioned the frequent dilatation of punctured wounds by means of tents, a still more absurd, and cruel practice.

Certainly, if the notion were true, that an important punctured wound, such as the stab of a bayonet, could be actually changed into a wound, partaking of the mild nature of an incision, by the mere enlargement of its orifice, the corresponding practice would be highly commendable, however painful. But the fact is otherwise; the rough violence done to the fibres of the body by the generality of stabs, is little likely to be suddenly removed by an enlargement of the wound. Nor can the distance, to which a punctured wound frequently penetrates, and the number and nature of the parts injured by it, be at all altered by such a proceeding. These, which are the grand causes of the collections of matter, which often take place in the cases under consideration, must exist, whether the mouth and canal of the wound be enlarged or not. The time, when incisions are proper, is when there are arteries to be secured, foreign bodies to be removed, abscesses to be opened, or sinuses to be divided; and to make painful incisions sooner, than they can answer any end, is both injudicious and hurtful. They are sometimes rendered quite unnecessary by the union of the wound throughout its whole extent without the least suppuration.

It is true, that making a free incision, in the early stage of these cases, seems a reasonable method of preventing the formation of sinuses, by preventing the confinement of matter, and, were sinuses an inevitable consequence of all punctured wounds, for which no incisions had been practised at the moment of their occurrence, it wonld undoubtedly be unpardonable to omit them. To many this may seem a fair reason for enlarging the mouth of a punctured wound. Fair, however, as it may appear, it is only superficially plausible, and a small degree of reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not form only where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way, in which the abscess communicates externally, so that the pus does not readily escape; or it may be the presence of some foreign body, or carious bone; or, lastly, it may be an indisposition of the inner surface of the abscess to form granulations, arising from its long duration, but removable by laying the cyst completely open. Thus it becomes manifest, that the occurrence of suppuration in punctured wounds is only followed by sinuses when the surgeon neglects to procure a free issue for the matter after its accumulation, or when he neglects to remove any extraneous bodies. But, as dilating the wound, at first, will only tend to augment the inflammation, and render the suppuration more extensive, it ought never to be practised in these cases, except for the direct objects, of giving free exit to matter already collected, and of being able to remove extraneous bodies palpably lodged. I shall once more repeat, that it is an erroneous idea, to suppose the narrowness of punctured wounds so principal a cause of the bad symptoms, with which they are often attended, that the treatment ought invariably to aim at its removal.

Recent punctured wounds have absurdly had the same plan of treatment applied to them as old and callous fistulæ. Setons and stimulating injections, which in the latter cases sometimes act beneficially by exciting an inflammation, that is productive of the effusion of coagulating lymph, and of the granulating process, can never prove serviceable when the indication is to moderate an inflammation, disposed to rise too high. The counter-opening, which must be formed, in adopting the use of a seton, is also an objection; and though French authors have given us accounts of their having drawn setons across patients' chests, in cases of stabs, they would find some difficulty in making the practice seem unattended with harm, much less, productive of good. The candid, and judicious surgical reader should not always think a plan of treatment right, because the patient gets well; for, there is an essential difference between a cure, promoted by really useful means, and an escape, notwithstanding the employment of hurtful ones.

Why, however, should we mention the use of a seton? What good can possibly arise from it? Will it promote the discharge of foreign bodies if any are present? By occupying the external openings of the wound, will it not be more likely to prevent it? In fact, will it not itself act with all the inconveniences, and irritation, of an extraneous substance in the wound? Is it a likely means of diminishing the immoderate pain, swelling, and extensive suppuration, so often attending punctured wounds? It will undoubtedly prevent the external openings from healing too soon; but cannot this object be effected in a better way? If the surgeon observe to insinuate a piece of lint into the sinus, and pass a probe through its track once a day, the danger of its closing too soon will be removed.

The practice of enlarging punctured wounds by incisions, and of introducing setons, is often forbidden by the particular situation of these injuries.

From what has been already stated, the reader must be aware, that I do not follow the bulk of surgical writers in recommending the indiscriminate dilatation of the orifices of punctured wounds; nor the use of the knife, for the purpose of preventing mischief only expected and apprehended, but not certain of taking place. Whenever I have attended bayonet, or other punctured wounds, unattended with any particular complication, I have always observed nearly the same principles as are now so generally approved of in cases of gunshot wounds. I have abstained from dilating the orifice of the injury, except when it was necessary, either to get at a bleeding artery in the first instance, or to give a freer egress to the discharge in a later stage of the case. I have given the preference to mild, simple, unirritating and superficial dressings. I have not placed much faith in the utility of enveloping the parts in a tight bandage; but, after applying the first superficial dressings, have usually covered the limb or part with linen wet with the lotio plumbi acetatis, or cold water. Whenever a roller was used, in the beginning of a case, it was not with the view of making pressure, but of retaining the dressings. The wound having been dressed, I then put in practice all such means as are generally deemed most efficient in preventing and diminishing inflammation; such as venesection, the exhibition of aperient saline medicines, low diet, &c. When the pain was severe, opiates were prescribed, and on the access of much inflammation and swelling it was an invariable rule with me to be sure that the bandage was slack. On the whole, I believe, that the application of superficial dressings and cold washes is the best practice for the first twenty-four hours after the receipt of a punctured wound. But if, after this period, the pain should increase, and the swelling and tension become more and more considerable, the surgeon may then remove the linen and bandages, and apply from six to a dozen leeches to the neighbourhood of the wound. He may also substitute for the cold lotions the use of fomentations and emollient poultices, under which is to be laid over the orifice of the would a small pledget of spermaceti cerate, or other simple ointment. The poultices and fomentations are to be renewed twice a day, and the leeches and venesection repeated if necessary.

Sometimes, under this treatment, the surgeon is agreeably surprised to find the consequent inflammation mild, and the wound united by the first intention. More frequently, however, in cases of deep stabs, the pain is intolerable; and the inflammatory symptoms run so high, as to leave no hope of avoiding suppuration. In this condition, an emollient poultice is the best local application; and, when the matter is formed, its discharge is to be procured, either by dilating the original wound, or by making one or more incisions in other places, as may seem most advantageous. In short, the treatment must then conform to the principles already noticed in the chapter on suppuration.

CHAP. XVII.

CONTUSED AND LACERATED WOUNDS.

The instruments, which have the effect of producing what is termed a *contusion*, are either of an ordinary description, such as a cudgel, a stone, &c.; or they consist of balls, bullets, and other metallic bodies, which are impelled into the flesh with immense velocity by the exposion of gunpowder. Indeed, a forcible collision of any blunt, obtuse, hard body against parts of the living body must contuse, and often at the same time wound them. Gunshot wounds, strictly speaking, are only examples of severe contused wounds, though surgeons find it expedient generally to treat of them as distinct and peculiar cases: and when it is recollected how many difficult, intricate, and momentous questions, the subject embraces, the necessity of considering it by itself is immediately manifest.

The blunt weapons, or obtuse hard substances, which being applied with violence to any part of the living body, bruise, rupture, and otherwise hurt the fibres and vessels, may produce two different species of injury. First, they may more or less forcibly compress and crush the parts, upon which they act, so as to disorder the texture of those organs which are situated under the integuments, without causing, however, any breach of continuity in the skin itself. This is the case, which is familiarly called a *bruise*, or *contusion*, of which one of the worst examples is seen in the effects of cannon-balls, which graze the surface of the body, and crush the muscles and other deep-seated parts, while the skin itself remains unbroken. Secondly, a hard blunt body violently striking against parts may produce at once a solution of continuity, extending through the skin, and sometimes also through other textures: this kind of accident is what surgeons name a *contused wound.* The latter injury more commonly follows, when the surface of the contusing weapon is not very broad. The cases, which rank as simple contusions, I shall consider in another chapter.

The majority of wounds are attended with some degree of contusion. Those which are inflicted with the blunt edge of a sabre, or the obtuse point and wedge-like end of a bayonet, are as much contused as punctured; and hence, like other contused wounds, they do not often admit of being united by the first intention. It must be confessed, indeed, that all our endeavours to reunite the sides of a contused wound, however skilfully directed, generally fail. An agglutination of the parts at most only takes place at the bottom of the wound, in which situation the flesh has suffered less contusion, the violence having spent itself, as it were, upon those parts upon which it first operated. Hence, suppuration of the external portion of the wound is mostly unavoidable. Still, the attempt at re-union ought to be made; for, if only the bottom of the wound heal by the first intention, it is a great advantage gained, more especially, when the surface of a bone has been exposed, and uncovered by the injury. In bringing the sides of contused wounds nearer together, however, the surgeon is not to attempt to do it with the same closeness, and accuracy, as in the instance of an incised wound. The injured parts would not bear the pressure, or the means requisite for this purpose; and it may be laid down, as an established rule, that nothing is more hurtful in cases of contused wounds, than much pressure, either from strips of adhesive plaster, or from rollers. In these cases, sutures are also totally unjustifiable; and I think that I have seen several examples, in which a rash determination of the surgeon to close large contused wounds with stitches, tight strips of plaster, and bandages, had no inconsiderable share in bringing on the rapid and fatal gangrene which carried off the patients. When I say, therefore, that a contused wound ought to be closed, and that its opposite surfaces should be brought nearer together, in order that the chance of some part of the injury uniting by the first intention may be taken, I do not mean to recommend dragging the parts together by main force, or placing them in a state of constriction. On the contrary, I think, that they ought to be left quite unconfined, the adhesive plaster being used very sparingly, and so put on as rather to hold the loose parts nearer each other, than to press and draw them into contact. Nor should the wound be covered with much plaster, as one or two strips will suffice for the object in view, and a greater number would create irritation, besides hindering other better dressings from touching the raw surfaces. Merely a strip or two are to be applied to such points, as seem most advantageous, for lessening the exposed surfaces, and all constriction should be most carefully avoided. That the practice, here advised, may be followed by a beneficial result, is proved by daily experience; and theory would lead us to expect such good, when we remember that, by preventing the wound from gaping in the manner it would otherwise do, we not only afford an opportunity for parts of it to reunite, but at once diminish an inevitable cause of inflammation and suppuration, viz. the continued exposure of a raw surface. Contused and lacerated wounds not only differ from incised wounds in the circumstance of being more disposed to suppurate, and slough, and more difficult to heal by the first intention, they differ also in the particularity of not usually bleeding much: sometimes, not even when the largest arteries are lacerated, as must be the case when whole limbs are torn away, in consequence of becoming entangled in different kinds of machinery. This indisposition to hemorrhage is not altogether a favourable omen, because though the patient runs less chance of bleeding to death in these cases, than in cut wounds, yet the very circumstance of the large vessels not pouring out blood evinces, that the violence, contusion, stretching, and other injury, done to the parts, in addition to the mere division of them, must have been excessively severe, and that the danger of the subsequent inflammation, suppuration, and sloughing of the parts, is more than a counterbalance to any advantage proceeding from the absence of hemorrhage.

In the records of surgery, no facts are more extraordinary, than those which have been published, at different periods, on the subject of whole limbs being torn away, not only without hemorrhage, but without any other fatal effects. The cases of limbs torn off, related by Cheselden, La Motte, Carmichael, Morand, and Gibson *, are some of the most remarkable.

All lacerated and contused wounds should be treated according to common antiphlogistic principles. When the injury is extensive, and attended with a great deal of contusion, venesection is to be practised, and any moderate oozing of blood from the surface of the wound may be promoted by the use of fomentations. With respect to dressings, they should always be of a mild unirritating quality. After lessening by a strip or two of adhesive plaster the exposed cavity of the wound, when this is large, and the surrounding skin loose, or detached from the subjacent parts, the wound may be covered with pledgets of the unguentum cetacei, over which should be laid an emollient poultice. The first dressings should not be removed for at least 24, or 36 hours. Afterwards, however, the dressings may be changed once, twice, and in bad cases, even thrice a day, for as soon as the sloughs begin to separate and suppuration commences, the necessity of renewing the dressings and poultices more frequently is evident. In severe cases, fomentations may be used at the periods of dressing, as nothing will be found more effectual for the relief of the pain. The employment of leeches also should not be forgotten, as a valuable means of palliating inflammation. Professor Asalini †, of Milan, has parti-

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* Institutes of Surgery, vol. i. p. 92. Philadelphia, 1824.

† Manuale di Chirurgia, 12mo. Milano, 1812.

cularly recommended the application of cold washes to contused wounds; and I believe the plan is decidedly useful in the first instance, when it is a great object to check the increase of extravasated fluids in the surrounding parts. I think cold applications are also highly proper when contused wounds are disposed to bleed more than usual, and yet, no large vessel presents itself as the source of the hemorrhage. But, in other periods and states of these injuries, I prefer emollient dressings.

If, in lacerated and contused wounds, the surgeon is less frequently called upon, than in incised wounds, to take measures for stopping bleeding immediately after the accident, he finds greater occasion for attending to another important duty, imposed upon him in his professional attendance upon wounded persons in general: I allude to the early removal of all foreign bodies and extraneous substances. Cuts are usually made with clean sharp instruments; but contused and lacerated wounds often occur in a manner which renders them very likely to be complicated with the lodgment of extraneous matter.

With regard to lacerated wounds, the same practical remarks apply to them, which have been offered on the subject of contused wounds; but the prognosis is generally considered more unfavourable, and, in warm climates, tetanus is a frequent consequence.

As soon as the surface of a contused or lacerated wound has thrown off its sloughs, suppurated, become clean, and evinced a tendency to form granulations, the poultices are to be discontinued, and simple dressings employed. The quality of these is afterwards to be altered, according to the future appearances of the sore; but, further directions, respecting the management of the case after it has arrived at this stage, will be found in the chapter on ulcers.

Some contused and lacerated wounds would be inevitably followed by a rapid mortification of the limb, and the patient run the greatest risk of losing his life, were amputation not performed immediately after the receipt of the injury. These are generally examples, in which the soft parts are extensively and deeply wounded, and large blood vessels and nerves also injured. When mortification attacks patients so circumstanced, it is the gangrene which Larrey has called *traumatic*, and in which he and some other modern surgeons conceive, that amputation may often be done with success, though the mortification has not stopped. The treatment of lacerated and contused wounds, in a gangrenous or sloughing state, must be regulated by directions, given in the chapter on mortification.

CHAP. XVIII.

OF GRANULATIONS AND CICATRIZATION.

Granulations are formed by an exudation of coagulating lymph from the vessels of the wounded or exposed surface. Into this substance new vessels extend, rendering it highly vascular. These vessels are described by Sir Astley Cooper as elongations of the vasa vasorum. According to Mr. Hunter, they pass from the original parts beneath to the bases of the granulations, and thence towards their external surface, in almost parallel lines. In other words, each artery, after having entered the base of the granulation, splits into many ramifications, which radiates to its surface. Granulations are also furnished with veins. They must be supplied with nerves and lymphatics; how tender they frequently are, every one knows; and it is equally well known, that medicines, applied to the surface of ulcers, sometimes find their way into the circulation, by means of absorption. According to Sir A. Cooper, the surfaces of old ulcers more readily absorb, than those of recent ones. He also states, that though granulations, springing from parts endued with great sensibility, are extremely sensitive; others, arising from an uninflamed bone have no sensibility whatever, unless they proceed from the cancellated structure. Granulations from tendons and fasciæ, are likewise represented as possessing little or no sensibility.

Granulations have the same disposition to secrete pus, as the surface from which they are produced. They are very convex, having a great many points, or small eminences, so as to appear rough. The smaller these points are, the more healthy the granulations. The colour of healthy granulations is a deep florid red. When of a livid colour, they are unhealthy; such appearance denoting that the circulation in them is languid. A depending position produces this livid hue, by retarding the return of blood: this is the reason, why some sore legs are so backward in healing, when the patients are allowed to stand and walk.

Granulations, when healthy, and situated on an exposed, or flat surface, rise nearly to the level of the surrounding skin, and often a little higher; but when they exceed this, and assume a growing disposition, they are unhealthy, becoming soft and spongy, and losing the power of producing new skin.

Healthy granulations are always prone to join with each other, and their vessels soon begin to inosculate: a fact, which, as Sir A. Cooper has justly remarked, in some measure accounts for the efficacy of circular strips of sticking plaster, which tend to bring the granulations into close contact with each other.

Granulations do not possess the powers of the original parts of the body; and consequently are very subject to mortify, or be absorbed.

It is, by the foregoing process, that nature fills up the hollows of deep wounds, the edges of which cannot be brought into contact, and it is by the same steps that she succeeds in filling up the cavities of abscesses. The work, however, is not quite reducible to this simplicity. All modern practitioners observe, that as soon as the formation of granulations commences, the diameter of the wound becomes diminished from every two points of its circumference, even before any new skin appears to be formed. The natural elasticity of the skin, and the contraction of muscles, satisfactorily account for the separation of the edges of a wound. But how these edges become approximated, during the granulating process, is not so well understood. It has been said, that it arises from the diminution of the swelling which surrounds the wound. This is by no means a satisfactory explanation, because we know, that the separation of the edges proceeds from a different cause, and takes place prior to the swelling, and immediately on the occurrence of the wound. Mr. Hunter attributed the beneficial effect to a contraction of the granulations. He says, " the contraction takes place at every point, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, although there is little or no new skin formed." This contraction of granulations takes place in a greater degree, and has a greater effect, when there is a looseness of the parts, on which they are formed. When they are situated on parts naturally fixed, as the skull, shin, &c. the contraction is impeded.

The contraction of granulations is not confined to open wounds; it takes place in the cavities of abscesses, which by this means contract like the urinary bladder, till little or no cavity is left. When the granulations cannot contract further, if any cavity be remaining, it is obliterated by the growth of the opposite granulations into each other.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin.

As the granulations contract, the integuments extend over the part deprived of skin; not by being stretched, but as the consequence of what Mr. Hunter terms *interstitial growth.*

The contraction of granulations is one of the most beautiful examples, illustrating the wisdom, with which the natural principles of the human body have been established. By it the formation of much new skin is rendered unnecessary; a great advantage, as original parts are much fitter for the purposes of life, than those which are new. By it, wounds, which, from neglect, have lost the opportunity of uniting by the adhesive inflammation, and others, which must necessarily heal in a more circuitous manner, are ultimately brought almost into the same state as if they had been united by the first intention. By this beneficial process, the cicatrix, compared with the original breadth of the wound, is often made as one to three.

After the whole wound is covered with skin, the remains of the granulations beneath it still continue to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison, with the first formed granulations; and, in time, it loses more of its apparent vessels, and becomes white, and like ligament.

When a wound begins to heal by the granulating process, the surrounding old skin, near the granulations, no longer exhibits the glossy redness, about one-fourth, or one-half of an inch in breadth, which it previously showed. The angular margin of the skin becomes converted into a roundish, smooth, and white boundary; and the nearer to the cicatrizing edge the whiter it is. This white substance Mr. Hunter suspected to be a beginning cuticle.

The new skin is a very different substance, with respect to texture, from the granulations upon which it is formed. It most commonly takes its rise from the adjacent old skin, as if elongated from it; but this is not regularly the case. I remember a workman in a laboratory who was dreadfully burnt with ignited spirits over the greater part of his body, in consequence of which he had extensive sores, occupying nearly the whole surface of some of his limbs. When these ulcers had considerably diminished, the power of producing skin seemed to lessen at the edges, but, at the same time, new portions of skin made their appearance at various parts of the ulcers, standing (as Mr. Hunter ingeniously describes) upon the surface of the granulations like little islands. Mr. Hunter was of opinion, that this production of skin, in the centre of sores, never happened the first time of their being sores. In the patient just mentioned, whom I saw in Mr. Ramsden's private practice, and attended a long while, the contrary fact took place. Sir A. Cooper considers, that the centre of an ulcer has not the power of forming new skin unless some portion or portions of the original skin should not have been completely destroyed. How far this observation will explain the fact, which presented itself to my notice, I cannot say; but, it is an original remark, and worthy of future attention.

In general, the surrounding skin seems to communicate a disposition to the surfaces of the adjoining granulations to form skin; just as bones give an ossifying disposition to granulations formed upon them.

The new-formed cutis is neither so yielding nor so elastic as the original. It is also less moveable, and destitute of the furrows observable on the old skin. At first, it is extremely full of vessels; but, afterwards, both it and the subjacent granulations become less vascular, and therefore white. The surrounding old skin is puckered into loose folds, while the new constantly retains a stretched, shining appearance.

The production of cuticle, from the new cutis, is a much more easy process, than the generation of skin. The formation of skin is chiefly progressive from the surrounding cutis; but the cuticle is frequently formed at once, and equally from every point of the cutis.

The rete mucosum is not so readily formed as the cuticle; but, at length, it is produced; for, in blacks, a cicatrix, which is at first reddish, after a little while, turns even blacker than the original skin.

CHAP. XIX.

GUNSHOT WOUNDS

Are produced by hard, obtuse, generally metallic bodies, like cannon balls, bullets, fragments of bomb-shells, &c. which being violently propelled by the force of exploded gunpowder, are driven into, or even quite through, the injured parts. There are also some exceedingly severe gunshot injuries, as we shall presently explain, in which the ball contuses and crushes the flesh, and sometimes breaks the bones themselves, while the integuments remain unbroken over all this concealed, and often unsuspected, mischief. Nothing can be more correct, than Mr. Hunter's observation, that the differences of gunshot wounds are referrible to three principal causes, viz. the kind of body projected, the velocity of that body, and the nature of the parts injured.*

Former surgeons, seeing the terrible mischief frequently arising from gunshot wounds, entertained a suspicion that the injured parts were either dreadfully burnt by the heat of the projected body, or were irritated by the presence of poison, as well as by mechanical violence. We learn from Paré, that when the King of France was besieging Turin, the besiegers and the besieged mutually believed, that their enemies had poisoned their balls, so cruel and intractable were the wounds; but after the taking of the city the soldiers of both parties met, and then they saw that their own clean and unpoisoned balls had made these cruel wounds. The moderns, better acquainted with the laws of projectiles, and the component ingredients of gunpowder, rightly attribute the ill consequences of gunshot wounds to the violence, contusion, and laceration, inflicted on the wounded parts. A ball, however great the rapidity of its motion, never acquires in its course any perceptible degree of heat; and that there is nothing poisonous in the composition of gunpowder is now universally known. The circumstance of the violence being produced in general by so obtuse a body as a musket ball, and often done with immense velocity, is fully sufficient to account for the usual severe consequences of these injuries. Bullets are the most common bodies shot into the injured parts; but the wound may be produced by cannon balls, pieces of broken shells, and very often on board of ship by splinters of wood. Large bodies of irregular figure, must occasion a greater quantity of mischief than such as are externally smooth, of a round form, and of moderate size. Pieces of clothes are also frequently carried along with the ball into the wound.

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* On the Blood, Inflammation, and Gunshot Wounds, p. 523. 4to.

Gunshot wounds are always attended with contusion and laceration, by which, most commonly, some of the fibres around the track of the ball are deadened, and must be thrown off in the form of a slough, before the parts can heal. Hence, these cases rarely admit of being united by the adhesive inflammation, but must suppurate; and, on this same account, they seldom bleed profusely, except when very considerable blood vessels are torn.

Besides the figure and magnitude of the body impelled into the living solids, the velocity with which it moves makes considerable difference. Hence, when a ball has passed with little velocity (which is sometimes the case at its entrance, but more frequently near its exit), the wound may often be healed by the first intention. At the entrance of the ball, the circumference is usually depressed; at its exit, prominent; and, in numerous instances, the adjacent parts have a livid appearance. The opening which the ball makes in entering a limb, is always smaller than that by which it passes out again.

On account of the parts, surrounding a gunshot wound, being often deadened, the nature of the injury cannot always at first be comprehended. A part of some viscus, a large artery, or even a bone, may have been deadened by the violence; but the mischief does not manifest itself before the slough separates.

The detachment of the deadened parts is usually not accomplished till about the sixth, eighth, or tenth day, and sometimes not till the fifteenth day, after the receipt of the injury; consequently, at these periods, there is the greatest danger of hemorrhage, extravasations of the contents of viscera, &c. The knowledge of these circumstances naturally suggests the propriety of letting the wound be most narrowly watched, at the falling off of the eschars, "for the blood often bursts out in the night, and, in the morning, the patient is found dead, bathed in his blood." *

When a gunshot wound only injures soft parts of ordinary importance, it is termed *simple*. When at the same time it fractures a bone, wounds a large artery, nerve, or important viscus, it is then called *compound*. The latter complications must greatly increase the danger of the accident, as any one may readily conceive, who knows the peril attending fractures, conjoined with a wound; the hazard of bleeding, or of mortification, when the main artery of a limb is injured; and the various consequences of wounds of the viscera, extravasations, &c.

The pain of gunshot wounds is often inconsiderable, so that in many instances the wounded are not even conscious of having received any injury. If, however, the ball has touched a large nerve, the pain will be severe, and the power of the part lost. Some men will have a limb carried off, or shattered to pieces by a cannon ball, without exhibiting the slightest symptoms of mental or corporeal agitation; while a deadly paleness, instant vomiting, profuse perspiration, and universal tremor, will seize another on the receipt of a slight flesh wound.* The frequent absence of a general agitation of the system for a certain time, after the receipt of bad gunshot wounds, I had many opportunities of noticing in the late campaigns in Holland and Belgium, where many a brave man was seen with a limb torn completely off, lying without any remarkable perturbation, and as quietly and composedly awaiting surgical assistance as if the accident had been only a slight injury. The most dreadful gunshot wounds, in fact, sometimes happen, without bereaving the patient of his senses and presence of mind for a moment. A memorable proof of this truth was seen in a young sailor, who presented himself some years ago at St. Bartholomew's hospital. A cannon ball had struck him on the shoulder, and, besides severing the limb from the body, had broken away a large portion of the clavicle, and split the scapula into numerous fragments. Yet, even on this severe occasion, there was no syncope, no bleeding of consequence, and the senses were not suspended for an instant.

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* John Bell, Discourses on the Nature and Cure of Wounds, p. 102, edit. 3.

The form, the momentum, and the direction of the shot which is received; the position and the variety of structure, or, in other words, the variety of density, and powers of resistance, in the part receiving it; are the principal causes influencing the course of the ball, in its passage through the substance of the body. Every new resistance, which a shot in motion meets with, operates so as to produce, not only a diminution of its momentum, but, also, a change in its direction. By adverting to the above circumstances, the strange course which some balls take, running nearly all round the body beneath the skin, may be satisfactorily explained. Their track, when it is thus superficial, is generally indicated by what Mr. Hunter compares to a blush, or, as Dr. Hennen says, by a wheal or dusky line, terminated by a tumour, in which the ball is contained; and sometimes where this mark is absent, a certain emphysematous crackling shows the course of the bullet, and leads to its detection. Some very extraordinary instances of the reflection of balls, from one part of the body to another, are recorded by the preceding author. The ball (he observes) is in many instances found very close to its point of entrance, having nearly completed the circuit of the body. In one case, which occurred to a friend of his in the Mediterranean, the ball, which struck about the pomum Adami, was found lying in the very orifice of its entrance, having gone completely round the neck. This winding course of balls is represented as particularly frequent when they strike the ribs or abdominal muscles; for, says Dr. Hennen, they are turned from the direct line by a very slight resistance indeed, although they will sometimes run along a continued surface like that of a bone, a muscle, or a fascia, to a very extraordinary distance. It is surprizing what a variety of parts may be injured by a musket ball, if there be nothing to check its course, and its momentum be very great. Dr. Hennen has seen cases where it traversed almost the whole extent of the body and extremities. In one instance, which occurred in a soldier with his arm extended, in the act of climbing up a scaling-ladder, a ball, which entered about the centre of the humerus, passed along it over the posterior part of the thorax, coursed along the abdominal muscles, passed deeply through the glutæi, and presented itself on the forepart of the middle of the opposite thigh. In another case, a ball, which struck the breast, lodged in the scrotum. *

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* Hennen's Obs. on some Important Points in the Practice of Military Surgery, p. 51. 8vo. Edinb. 1818. A valuable work, the third edition of which is about to be published.

It was formerly supposed, that a ball might injure parts of the body in two ways, viz. by actually striking them, and by passing close to them, without touching them at all. This last kind of injury was called a wind-contusion, and supposed to originate from the violent commotion produced in the air by the rapidity of the ball. It consists of a forcible bruising, and even comminution, of the soft and hard parts situated beneath the skin, which itself remains entire.

The above mode of explaining how this violence is occasioned, is too absurd to need a serious refutation. The slight disturbance of the air is too feeble to account for the degree of violence committed. The air, to which the ball must impart the greatest motion, is that which is directly before it; and yet this does not do the smallest degree of violence to the parts surrounding the spot at which the ball enters. Cannon balls often strike limbs, without the neighbouring parts being in the least hurt. Pieces of soldiers and seamen's hats, feathers, clothes, and even hair, are frequently shot away, without any other mischief. These *wind-contusions*, as they have been improperly named, are now well known to be caused immediately by the ball itself; and its occasioning a violent contusion, without wounding the skin, or entering the limb, is referrible to the sloping direction in which it first strikes the surface, and to its being reflected.

Surgeons ought to feel themselves under great obligation to Ambrose Paré, for the more accurate opinions, which he first introduced, concerning *wind-contusions*. But no man has exposed the absurdity of supposing that life may be extinguished by the "whiff and wind of a ball" better than Mr. John Bell. "The reason of all these wonderful tales about the wind of a ball (says he) is itself very wonderful. Men often fall in the field of battle, and when the camp-followers come to turn over their bodies, in burying the dead, no wound nor mark of injury is seen; and often also men are laid in the military hospitals, dying and unable to speak, upon whom there is found no kind of wound, nor even the slightest bruise of the skin. Now this apparent difficulty will disappear, when I state (says Mr. John Bell) that a limb is often broken while the skin remains unhurt, and a dreadful fracture it is; for when a great bullet strikes fairly it knocks off the limb, but when it strikes obliquely it buffs along the skin, the ball is turned away, and the part struck becomes insensible at the instant; there is no feeling of the terrible accident that has happened; the patient is sensible of nothing more than a confused shock; hardly knows where he is struck, and falls down. This fracture is of the worst kind, for it is accompanied with such a bruising of the parts that they never can be restored; and though the skin is still entire, there is much blood extravasated, the muscles are in an instant reduced to a gelatinous and pulpy mass, &c. Let a ball hit any of the great cavities thus obliquely, and this phenomenon appears; the patient is killed without any external wound. He is killed, according to the notion of his fellow-soldiers, by the wind of some great ball. But we know that the ball has actually struck him, that the breast, the belly, or the head, has been hurt. If the chest has been struck, then the ribs have perhaps yielded, and escaped the blow, but the lungs have suffered, and there is often blood extravasated in the chest. In the belly there is often a bursting of the liver, or spleen, without any outward wound of the skin; very frequently in the head, though there appears no outward injury, the pericranium is separated from the skull, and there is an effusion of blood upon the brain." *

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* Hennen, op. cit. p. 33.

KINDS OF EXTRANEOUS BODIES LODGED IN GUNSHOT WOUNDS.

Extraneous bodies are more frequently met with in gunshot wounds, than in any others. They are commonly of three sorts: 1. Pieces of clothes, or other substances, which the ball has driven into the flesh: 2. the ball itself: 3. or lastly, loose, splintered portions of bone. They are the cause of many bad symptoms: for they irritate the wounded parts so as to excite pain, inflammation, a disposition to hemorrhage, copious, and long-continued suppuration, &c., and the more uneven, pointed, and hard they are, the worse are their effects.

When there is only one opening, the surgeon has a right to conclude, that the ball is lodged; for I need scarcely lay down as exceptions to this observation, the very rare cases, in which the ball, after making a deep wound, is found in the patient's shirt. In these instances, the foreign body carries a piece of shirt with it into the part, without going through the linen, and when the latter is inadvertently drawn out, the ball is also extracted. An officer who wore a silk handkerchief in his breast had several duplicatures of it

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* See John Bell's Discourses on the Nature and Cure of Wounds, pp. 175—177. Also Larrey's Mém. de Chir. Militaire.

actually carried into the pectoral muscle by the ball, which was afterwards drawn out with the handkerchief.*

When there are two apertures, we may infer, that the ball has passed out. However, pieces of the clothes may still be lodged in the wound; for, as they are lighter, and move with less impetus, than the shot itself, they must be more likely to be left behind.

In Dr. Hennen's publication, several very curious instances may be read, in which the foreign bodies were either of enormous size, or of an uncommon kind. A spent twelve-pound shot is there stated to have been found in the fleshy part of the thigh of an officer, who was killed at the siege of Seringapatam.† In another case, which happened in Belgium, a pantaloon pocket of coarse linen, containing two five-franc pieces and two small copper coins, was extracted from the substance of the vastus externus muscle.‡ In one still more curious instance, two five-franc pieces, and a Dutch stiver, closely beaten together, were extracted from the thigh of a soldier, who had no money about him previously to the injury, and who accounted for the situation of these coins, by supposing that they had been carried from the pocket of his comrade, who stood before him in the ranks, and who had been killed by the same shot.§ A case is also detailed, in which several fragments of a cranium were taken from a lacerated wound of the thigh; and others, in which pieces of different bones, and even teeth, not belonging to the patients themselves, were found imbedded in their flesh.

TREATMENT OF GUNSHOT WOUNDS.

The first thing in the treatment of a gunshot wound of one of the extremities, is to determine, whether it is more advisable to amputate the wounded limb immediately, or to undertake the cure of the injury.

When a bone, especially at a joint, is shattered into numerous fragments; when the soft parts are, at the same time, extensively contused and lacerated, with injury of important blood vessels and nerves; and when at the same time the whole limb is thrown into a cold and insensible condition by the violence of the shock; no resource is so safe as amputation; and delay, under such circumstances, would lead to almost certain death.

Larrey says, when a body is projected from a cannon, and strikes a limb, so that the bones are fractured, and the soft parts violently contused, extensively torn and comminuted, amputation should be instantly performed. He recommends the same practice, when a large portion of the soft parts and the principal vessels of a limb, are carried away by a ball, and the bone fractured. He represents the operation as equally indispensable when a large ball strikes the thick part of a limb, breaks the bone, cuts and tears the muscles, destroys the great nerves, and yet leaves the principal artery entire. When a spent or rebounding ball has struck a limb obliquely, without causing a solution of continuity in the skin, while the bones, muscles, tendons, and aponeuroses, are torn, broken, and crushed, Larrey thinks the following conduct proper: the extent of the injury must be ascertained, and if the bones be fractured under the soft parts, and there be ground to suspect, that the great vessels are lacerated, amputation should be performed. But, if the vessels and bones have been spared, and the muscles alone have been totally disorganised, he is content with the practice recommended in the Memoirs of the French Academy of Surgery, viz. that of making an incision, and letting out the thick, black, extravasated blood. Larrey then instances fractures of the articular heads of the bones of the knee and ankle by gunshot, and the extensive denudation of a large portion of bone by a ball which has passed through the limb, as demanding immediate amputation. The latter case, however, is not quite so clear; for much must depend on the situation and quantity of injury inflicted. Perhaps the opinion given by another surgeon on this particular accident is more correct, namely, that where the ball is no larger than one projected from a musket, it is more advisable to wait and be governed by consequences.[*] I entirely differ, however, from the American surgeon who infers from one example, in which a patient recovered with a stiff-joint, after being shot through the knee with a musket-ball, and from a few other rare escapes, that Larrey was wrong in pointing out such injuries as decided examples demanding immediate amputation. On the contrary, all the gunshot injuries which I noticed abroad, that had been caused by the passage of balls through the knee-joint, fully confirmed the propriety of the general rule of amputating the limb thus injured. With respect to cut wounds of large joints, I allow with Mr. Mann, that they are not always cases positively demanding the immediate performance of the operation.

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* Hennen's Military Surgery, p. 35.

† P. 83.

‡ P. 87.

§ P. 88.

But below some of these violent degrees of injury, in which the necessity of immediate amputation can be readily and positively settled, there are several inferior degrees, in which the soundest judgment is required to form a prudent determination. In many of these cases, the scale is so delicately balanced, that an opinion is not to be formed from a consideration of the injury alone. In dubious cases, the patient's constitution, the possibility or impossibility of procuring good accommodation, rest, attendance, and pure air, are matters which ought to have weight.

Bilguer published an essay, in which the practice of amputation was condemned as an operation hardly ever proper.[†] The arguments, broached in this extraordinary production, however great their influence might once be, can no longer mislead any practitioner of common sense. In France, the absurdities of Bilguer's work were long ago ably exposed by La Martinière*; and in England by Mr. Pott†: while more recently some judicious criticisms on his statements were drawn up and published by Mr. Guthrie‡, a gentleman whose evidence is valuable, as being founded upon the great opportunities of observation and comparison, of which he availed himself during the war in the Peninsula. Nothing is now better known and established than that, in many cases of bad gunshot injuries of the limbs, the patient's only chance of preservation depends upon the performance of amputation.

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[*] Mann's Medical Sketches of the Campaigns of 1812, 1813, 1814, &c. p. 210. 8vo. Dedham, 1816.

[†] De Membrorum Amputatione rarissimè administrandâ aut quasi abrogandâ.

Another question, that was not quite so well settled a few years ago as it is now, is at what time amputation should be done in cases of gunshot wounds, where such operation is allowed to be indispensable. In 1756, the French Academy of Surgery conferred its approbation on a memoir written by M. Faure, who was an advocate for delaying the operation until the first bad symptoms were at an end. Mr. Hunter was in favour of the same practice. Upon the whole, however, reason, experience, and authority are strongly against delay. The immediate performance of the operation is urged by La Martinière, Le Dran, Ranby, Kirkland, Larrey, Guthrie, Hennen, Thomson§, &c. Larrey's valuable works contain the most decisive facts in support of this practice; facts, drawn from extensive experience and a comparative trial of both methods ||, while nothing can be more unequivocal and convincing, than the important cases and observations to be found in the practical writings of the other authors, to whom I have referred.

It is a doctrine, frequently inculcated in the schools, that a man who has been long habituated to disease, is more likely to bear an operation well, than another man, who is suddenly necessitated to part with his limb for an accidental injury. It would be quite unnecessary for me to assert, that there is no truth in this opinion, in relation to some of the operations performed in civil hospitals. What I saw during my apprenticeship, at St. Bartholomew's, left me with an impression, that amputations done immediately after accidental injuries were generally less successful, than similar operations done for the removal of white swellings, and other chronic diseases. But, then, this has nothing to do with the question before us; for it does not prove any thing at all, with respest to the advantages or disadvantages of immediate amputation in bad acci-

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* Mém. de l'Acad. de Chir. tom. iv.

† Remarks on the Necessity, &c. of Amputation in certain Cases. Pott's Works, vol. iii.

‡ On Gunshot Wounds of the Extremities, &c. p. 7, &c. 8vo. Lond. 1815.

§ Report of Obs. made in the Military Hospitals in Belgium, with some Remarks upon Amputation, 8vo. Edinb. 1816.

|| See Rélation Historique et Chir. de l'Expédition de l'Armée d'Orient, en Egypte et en Syria; Par D. J. Larrey. Paris, 1803; and Mém. de Chirurgie Militaire, 4 tomes, 8vo. Paris, 1812—1817.

dental injuries, but, merely, that the amputation of a diseased joint generally terminates better, than that of a shattered limb. We have still to enquire, whether, if the amputation had been delayed in such cases of badly shattered limbs, where confessedly there was no hope of saving them in the end, the operation would have had more extensive success. The question would then be more to the point; because gunshot wounds rank as accidents. Now, as far as we can believe the testimony of the most experienced writers, especially that of Mr. Pott, we are bound to conclude, that the operation should be done, in every case of this kind, without the least delay. And, with respect to such gunshot injuries of the limbs, as are decidedly fit cases for amputation, because no rational chance of saving the part can be entertained, Larrey, Guthrie, Hennen, Hutchison*, and all the latest and most experienced authors on military surgery, unanimously agree about the necessity either of the immediate, or very early performance of the operation. They further agree about the dangers of delay, and the infinitely greater number of recoveries following the speedy use of the knife. Respecting some little difference of sentiment on the point, viz. whether we should wait till the patient has revived a little from the first effects of the injury, or, (as the expression is,) whether the knife ought to follow the shot as speedily as possible, I believe, this is rather a seeming, than a real difference. No man would amputate while a man is lying in a state of depression and syncope, perhaps, with hardly any pulse, warmth, or animation. Here we must all coincide with Mr. Guthrie, that it is better to wait a little, and that to let the knife follow the shot would probably destroy the patient upon the operating table. But, should the patient not be thus dangerously depressed, then neither Mr. Guthrie, nor any other army surgeon, would think of proposing delay. With this understanding, therefore, I conceive the following passage to be judicious and correct: " If a soldier, at the end of two, four, or six hours, after the injury, has recovered from the general constitutional alarm occasioned by the blow, his pulse becomes regular and good, his stomach easy, he is less agitated, his countenance revives, and he begins to feel pain, stiffness, and uneasiness in the part; he will now undergo the operation with the greatest advantage, and, if he bears it well, of which there will be but little doubt, *he will recover in the proportion of nine cases out of ten in any operation on the upper extremity, or below the middle of the thigh*, without any of the bad consequences usually mentioned by authors as following such amputations."† For all those injuries, in which amputation must absolutely be done, in order to give the patient the best chances, the practical and common maxim with army surgeons is, as Dr. Hennen observes, to proceed to the operation with as little delay as possible. While hundreds are waiting for the decision of the surgeon, he will never be at a loss to select individuals, who can safely and advantageously bear to be operated on, as quickly as himself and his assistants can offer their aid: but he will betray a miserable want of science indeed, if, in this crowd of sufferers, he indiscriminately amputates the weak, the terrified, the sinking, and the determined. While he is giving his aid to a few of the latter class, encouragement and a cordial will soon make a change in the state of the weakly, or the terrified.*

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* Some Practical Observations in Surgery, 8vo. Lond. 1816.

† Guthrie on Gunshot Wounds of the Extremities, p. 24.

In all sudden injuries of the limbs, from great external violence, as gunshot wounds of the extremities truly are, there are generally only two periods, at which amputation can be performed with much prospect of success. The first is immediately after the occurrence of the injury, before inflammation arises, and before a disposition to gangrene commences in the limb. This period only lasts a few hours; and, when these have elapsed, the dangers of mortification and death must be faced. With regard to amputating when the limb is universally swollen, and in a state approaching to gangrene, however favourably we may be disposed to think of the practice under circumstances noticed in the chapter on mortification, and when an earlier and better opportunity has been lost, we cannot then compare the chances of recovery to those, which might have been obtained by an earlier operation. On the contrary, in this late stage of the case, the patient's condition is desperate, whether amputation be done, or not.

If, however, these immediate perils should be got over, and the wound be brought into a state of suppuration, the violent inflammation and swelling abate, and, while the patient's strength yet remains adequate, the opportunity of amputating is once more afforded. But if the state of the patient is now not more favourable for an operation than it was directly, or soon after the accident, what has he gained but a great deal of avoidable pain and suffering? The necessity of the operation was acknowledged; its general success, when done early, is sufficiently proved; the second opportunity of doing it is frequently lost for ever by the patient's intervening death; and, if it should come, it brings not with it the same promise of recovery as the first did.

There are further reasons for preferring amputation to an attempt to preserve limbs, which have been severely shattered by gunshot wounds.

1. By means of the operation, the patient gets rid of a dreadful contused wound, which threatens the greatest peril to his very existence, and exchanges it for a simple incised wound.

2. The pain of the operation is not, upon the whole, a greater severity, than the aggregate pain arising from the inflammation, irritation of extraneous bodies, and incisions for their evacuation and that of matter, in cases in which an effort is made to preserve the limb.

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* Obs. on several important Points in Military Surgery, p. 49.

3. The loss of the limb ought not to be taken into the scale; for, the surgeon only amputates on the principle of saving the patient's life by that privation. When life is at stake, and it is more likely to be saved by the operation, than both life and the limb together without the operation, it is our duty to amputate. By this maxim, no doubt, a small proportion of limbs, which might be preserved, will be sacrificed, but the patient's life will be more frequently saved. Limbs, which are saved after these dreadful injuries, are also very often not more useful than a wooden leg; and the vigour of the constitution is sometimes irrecoverably lost for a limb, which is rather a burden than a convenience.

Perhaps, in the army, surgeons may sometimes be justified in amputating limbs, which it might be proper to endeavour to save, under all the advantages and conveniences of private practice. The necessity for the operation must evidently be greatly increased, when circumstances demand the patient's speedy removal from the field of battle to an hospital at a distance. The difficulty of conveyance; the bad accommodation in the military waggons, into which the wounded are crowded; the painful jolting, to which they are there subjected; and the way in which they are exposed to the inclemency of the weather; are all weighty reasons in favour of taking off the shattered limb. When the bones are broken and splintered, the sharp spiculæ are forced by the motion of the carriage still further into the flesh, and thus cause infinite suffering and vast additional mischief. Frequently, when the operation is put off, the disturbance of the parts in the journey so bruises and lacerates them, that the patient perishes in the most cruel agony, before he arrives at the hospital, which is intended for his reception.

As Larrey observes, the dangers of a long residence in an hospital are also much diminished by amputation, which converts a gunshot wound into one which is capable of being speedily healed, and obviates the causes that produce hospital fever and gangrene. In case the wounded should be left on the field of battle, it is then important that amputation has been performed, because, when it is completed, they may remain several days without being dressed, and the dressings can afterwards be changed with greater facility.

When the upper part of the os humeri is fractured by a musket ball, the necessity for amputating the limb may frequently be obviated by making an incision down the centre of the deltoid muscle, and extracting the splintered head of the bone. The facts recorded by Boucher*, Vigaroux†, and Mr. C. White‡, first exemplified the possibility of saving the whole arm by the excision of the upper portion of a diseased or shattered humerus; and the propriety of a similar proceeding in some gunshot fractures of the upper part of that bone, has been well proved in Larrey's practice. In Egypt he superseded all occasion for amputating the limb, in no less than ten instances, by extracting without delay the head of the humerus and the fragments of bone; and, in his subsequent campaigns, the propriety of the practice was verified in a much larger number of examples. After the operation the humerus is to be kept up to the shoulder with a sling and a bandage. In one most remarkable and successful instance, the scapulary end of the clavicle, the acromion, and the head of the humerus, were so broken to pieces, by the ball of a four-pounder, that the removal of all these parts was unavoidable. In some cases, an artificial joint is formed; in others, an anchylosis follows.* Mr. Mann, assures us, that, in several dreadfully lacerated wounds of the shoulder, he also saw the patients recover without amputation, care being taken to remove the splinters of bone.

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* Mém. de l'Acad. Royale de Chirurgie, t. v. p. 502, &c.

† Œuvres de Chirurgie Pratique. Montpellier, 1812.

‡ Cases in Surgery, p. 57.

In one case, the superincumbent muscles of the shoulder, with part of the subjacent, were destroyed, leaving a small portion in the axilla, connected with the principal artery, which received no injury. The acromion process and clavicle were fractured. The head of the humerus was broken, and four inches of the bone forced away by the ball, leaving an inch of its extreme head in the socket. Mr. Mann deemed amputation necessary to save the wounded officer's life; but the proposal was rejected. The fractured pieces of bones were removed, and by careful attention to the wound the arm was saved, so as to be of some use. Two other very interesting cases of a similar kind are also recorded, in which many splinters were extracted, pieces of the humerus sawn off, and some of the deadened portions of muscle cut away. The successful termination of these cases induces Mr. Mann to assert, that such will be the general result when the patient's health is good; and that the limb can be saved, with the small deformity of too sudden a sloping of the shoulder.† In a severe injury of the head and neck of the humerus, Mr. Guthrie thinks, that if the splintering extends to the body of the bone, amputation should be performed; if it be confined to the head and neck of the humerus, excision may be practised.‡ One would suppose, it must generally be better practice, rather to be content with making a free incision through the deltoid, and extracting all the loose splinters of bone, than attempt the formal excision, or sawing off of the whole upper part of it; a proceeding which Mr. Guthrie * adduces cases to prove is not always necessary, even where the head of the bone is much shattered.

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* Relation Historique et Chirurgicale de l'Armée d'Orient en Egypte et Syria, p. 315.; and Mém. de Chirurgie Militaire.

† Medical Sketches of the Campaigns of 1812, 1813, and 1814, &c. pp. 208, 209.

‡ On Gunshot Wounds of the Extremities, p. 248. I remember an artilleryman, at Merxam, near Antwerp, the greater part of whose shoulder was carried away by a 24-pound shot, and all the adjacent parts so broken and lacerated, that the lungs and pericardium were visible. The man, however, recovered without amputation. This case was also seen by the late Mr. Curtis, surgeon of the 1st guards, and by Sir Andrew Halliday, gentlemen then on duty with myself. The latter has given some account of it in the Edinb. Med. and Surg. Journ. vol. xi. p. 140.

THE DILATATION OF GUNSHOT WOUNDS, AND THE EXTRACTION OF FOREIGN BODIES, CONSIDERED.

When amputation was not deemed necessary, the old surgeons used, according to the customary precepts, to enlarge the aperture of the wound by an incision. Numerous advantages were alleged to result from such a dilatation: it was said to facilitate the extraction of foreign bodies; to occasion a beneficial effusion of blood; and to promote the escape of fluids extravasated in the surrounding cellular substance. Dilating the wound by an incision, was also absurdly supposed to convert the fistulous track of a ball into an open incised wound, and, thereby, render its nature more benign, while another good effect, supposed to result from the practice, was the division of unyielding parts, which confined, and thus aggravated the internal swelling.

More modern experience has clearly proved, that the utility of these incisions has been overrated. The knowledge, that gunshot wounds are of various descriptions, ought at once to condemn the unlimited plan of dilating all of them. When the course of the ball lies in soft parts, and has neither touched a bone, nor a considerable blood vessel, whether the wound have one or two openings, the scheme of dilating it is productive of no good. In gunshot wounds, the aperture in the skin is at first generally wider than the orifice of punctured wounds and stabs; and by the separation of the sloughs, the diameter of the first class of injuries is rendered still larger, so that not only matter, but foreign bodies, often find a ready outlet. Incisions also usually soon close again, and the wound becomes, in a few days, in the same condition as if no dilatation had been made. Gunshot wounds, therefore, are to be dilated, only when there is some plain and beneficial object to be accomplished by it.

No doubt, it is right to extract, at first, as many foreign bodies as possible; for, while they continue in the wound, they always exasperate the inflammatory symptoms, and sometimes create agitation of the whole nervous system. By an early extraction of them, profuse suppuration may often be prevented. Yet, let it be remembered, that the search for foreign bodies is frequently attended with great irritation of the wound; and that in numerous instances it is impossible to find and extract them immediately, as, for instance, when they are deeply, and firmly fixed in parts. When the wound is widened by the separation of sloughs, they generally become loose, and, on both accounts, their extraction may then be more easily peformed. After having been deeply

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* On Gunshot Wounds of the Extremities, p. 550, &c.

lodged, they sometimes spontaneously approach the surface, on the occurrence of suppuration. Lastly, it is to be observed, that foreign bodies, of smooth figure, have often remained, without the least inconvenience, in parts from which they could not possibly be extracted.

Hence, the surgeon acts wisely, who seeks at first to extract only such foreign bodies as are near the external opening, and loose, and removable without much irritation. When, however, they make pressure on an important part, a large artery, a considerable nerve, or important viscus, so as to create violent and dangerous symptoms from this cause, an incision is warrantable for their removal even when deeply lodged. If a large artery bleed, it is to be exposed and tied, as in other wounds. Sometimes when there is reason to expect a fracture of the skull, an incision may be judiciously made to examine the bone; that is to say, if there are symptoms leading to a suspicion that a part of the bone is depressed, and makes dangerous pressure on the brain. In this circumstance, it would not only be advisable to examine the state of the cranium, under the scalp, but even to remove such parts of the bone as are either splintered, or beaten inward. Depressed portions of the sternum and ribs may also require incisions.*

When the ball lodges in any of the large cavities, incisions are mostly improper, because the foreign body cannot be traced, and, therefore, they answer no direct purpose. When the ball enters far into the substance of a bone, the dilatation of the wound would also be of no utility.

But all that I have said upon this head is insufficient to guide the surgeon in every case. If the dilatation of the wound, for the purpose of extracting foreign bodies, should be less likely to aggravate the inflammation, than the presence of those bodies, then it is highly judicious to put it in practice; but, in every case in which the ball cannot easily be discovered, one may safely decide to abandon all painful examinations. Experience shows, that its lodgment does not always give rise to bad symptoms. In some instances, the ball remains on the side of the limb opposite to its entrance, beneath the integuments. If the skin, under which the ball is lodged, be contused in such a way, that it will probably slough, it is to be considered as a lifeless part, and an opening is to be made into it for the extraction of the ball. But, when the ball lies so far from the skin that one can only just feel it, and the skin itself remains uninjured, Mr. Hunter disapproved of making a counter-opening. His experience taught him, that the wound healed much better when the ball was let alone, and that the chief inflammation was not in the vicinity of the foreign body, but about the mouth of the wound. In cases, in which a counter-opening had been made, Mr. Hunter noticed, that the same inflammation sometimes attacked it, which took place at the entrance of the ball. However, notwithstanding this high authority, I had many opportunities of seeing, while I was abroad, that the rule here inculcated was not followed. On the contrary, army surgeons of the present day always make it a maxim to extract the ball as soon as possible, when situated as above described. "The ball (says a late writer) will frequently have passed nearly through the limb, and be retained only by the elasticity of the common integuments. There we cut upon and extract it at once;" and he then recommends extracting on the spot every extraneous body that we possibly can, either with the forceps alone, or the aid of the bistoury.*

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* See Hunter on the Blood, Inflammation and Gunshot Wounds, p. 535, &c.

Screws, gimblets, and bullet-drawers, ought seldom to be used in extracting bullets. The fingers are commonly the most proper instruments; and, when forceps are judged more convenient, they should not be of a large clumsy construction.

Although one might judiciously omit an incision to extract a smooth round body, like a leaden bullet, one might not always act with equal judgment in doing so, when the extraneous body is of an angular figure, and large size, so as to be likely to cause immense irritation.

Detached splinters of bone are very irritating; and when their extraction can be accomplished, consistently with the above principles, it ought never to be neglected.

In gunshot wounds, ligamentous bands sometimes compress the subjacent tumefied parts; but, it is only when they unequivocally do so, or when they confine matter, that the knife should be employed to divide them.

DRESSINGS, AND CONSTITUTIONAL TREATMENT.

The best general dressings for gunshot injuries, and the absurdity of several of the former modes of treatment, were accidental discoveries, if we can use that expression, when the genius of a Paré was concerned in making them. "I had heard of nothing (says he) so often as of the poisoned nature of gunshot wounds, and had read both in De Vigo and in Guy de Chauliac of burning them with burning oils. When the French armies made their way into Piedmont, many of our soldiers were wounded in the smaller garrisons; and I saw the army surgeons using their terrible cauteries, and I also followed the common practice, and dressed the wounded with boiling oils, until all my oils were expended. On the night when this happened, I dressed my wounded soldiers with oil of roses, and turpentine with whites of eggs. I went to bed much oppressed, with the apprehension, that all these poor fellows would be found in the morning poisoned and dead. I arose, therefore, betimes, and learnt, to my infinite surprise and pleasure, that they had slept well and easy; without any pain, or swelling, or redness about the wounds, while those of my soldiers who had been cauterized with hot oils, had great fever and swelling, and excruciating pain." This fortunate accident made Paré afterwards invariably prefer the milder dressings; a wise resolution, to which he probably owed all his future success.

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* Hennen's Obs. on some important Points in Military Surgery, p. 32.

From the degree of contusion, laceration, and sloughing, produced in the generality of gunshot wounds, no hope of union by the first intention can be entertained. Supposing the degree of injury is not such as to demand the immediate performance of amputation, and yet the bones are fractured, and the limb otherwise considerably hurt, the surgeon is first called upon to extract whatever splinters of bone and foregin bodies admit of being taken away without too much irritation. Should any violent hemorrhage exist, which is not a frequent event in these cases, the bleeding vessel must be secured without delay. The limb is then to be laid on a splint, that has upon it a thick pad, and an eighteen-tailed bandage. The wound is to be dressed with dry lint, or, what is always preferable, a pledget of common cerate. I think adhesive plaster, which is sometimes recommended as a first dressing for gunshot wounds, never answers so well as common lint, or pledgets of any simple ointment.

The tails of the bandage are to be methodically laid down over each other, and these, with some folds of linen, which are to be placed along the limb, may be wet with the liquor plumbi acetatis dilutus, or, what is equally good, simple cold water. The practice of keeping the wounded limb, or part, thus enveloped in linen wet with cold lotions, or common water, cannot be too highly commended, as an excellent plan for the first day or two, and one that can always be pursued with ease under any of the circumstances and difficulties which occur in the military service. Even were the wounded simply to have their injuries covered at first with loose wet linen, instead of tight bandages, I believe we should see fewer cases of mortification than actually occur. The wound having been dressed, such other pads and splints as may be requisite, are then to be put on the member, and secured with straps and tapes. Lastly, the limb is to be put in the most eligible posture, and be kept as quiet as possible.

If the patient be young and strong, and should not have lost much blood, he is to be immediately bled, unless the system appears temporarily depressed by the shock of the accident, in which circumstance the surgeon should rather administer cordials. Besides occasional bleedings, according to circumstances, the application of leeches to the neighbourhood of the wound, is extremely beneficial during the inflammatory stage; and, indeed, so are all the means advised for the relief of inflammation.

In the course of the first 24 hours, the swelling of the part and the inflammatory fever come on. In a fracture, it will generally be best to persist in the employment of cold lotions, because the linen and bandages can be wet with them without taking off the splints, and disturbing the limb, as must be done if poultices be employed. When, however, suppuration begins, the pledgets and first dressings must be removed; and then the surgeon, if he prefer the method, may have recourse to emollient poultices, though they are always inconvenient applications under splints. In all other cases, they are undoubtedly the best local remedies, after the first day or two, during which cold lotions may be used with great advantage. Saline and aperient draughts are to be administered, and, if the pain be severe, opium. Should mortification follow, notwithstanding every effort to counteract it, the surgeon is to take the proper opportunity to amputate, and not wait, as was formerly advised, until an inflammatory reddish circle indicates the commencement of a separation of the living from the dead parts.

If the inflammation terminate in suppuration, the quantity of matter is, in some measure, proportioned to the contusion and other mischief; and, when the case prospers, the inflammatory symptoms abate, the eschars are thrown off, the quantity of matter gradually diminishes, the cavity of the abscess is filled up with healthy granulations, the broken bones unite, and the patient at last recovers.

Unfortunately, in many cases, things do not go on in this desirable way. The pus does not become less copious, and it assumes a sanious, thin, fetid quality. The greatness of the discharge brings on weakness and hectic symptoms, and the patient falls into a dangerous state. Here the nicest judgment is often required in deciding, whether the attempt to save the limb should be continued, or amputation be done without delay.

In the suppurative stage of gunshot wounds, the same internal medicines and diet, and the same external applications, are indicated, which I have specified in the chapters on suppuration and ulcers.

In cases of gunshot wounds, then, the dressings are to be superficial, and of the mildest description possible; at first some lint and a pledget of white cerate, with cold applications, and afterwards emollient poultices and fomentations. What good can introducing lint into the orifice of a gunshot wound produce? Is this practice designed to prevent its closure? If it is, the idea is absurd, as gunshot wounds are little disposed to unite by the adhesive inflammation. Fomenting the part, two or three times a day, with a decoction of white poppies, certainly deserves recommendation; for it always diminishes pain, and, consequently, must have a good effect on the inflammation. The consolidation of a gunshot wound is the work of nature. The steps, which she takes to effect it, have been noticed in treating of granulations. A suppurating gunshot wound is only an abscess, in which there are frequently extraneous bodies. To maintain a ready exit for the pus, and to remove all extraneous matter, which may be loose, and sufficiently near the surface of the body, is all the surgeon can usefully do.

When a limb is torn off by a cannon ball, all the best army-surgeons recommend amputation of the stump, in order to procure an even, smooth incision, instead of an irregular, jagged, and highly dangerous wound. Even Mr. Mann *, hospital-surgeon of the American army, and by no means a zealous advocate for immediate amputation in many cases now considered as urgently requiring such a proceeding, accedes to the proposition, that, when a limb is carried away by a ball, or by the bursting of a grenade or a bomb, the most prompt amputation is necessary, and that the least delay endangers life. As the bone is liable to be split extensively upwards, some even deem it invariably necessary to perform amputation, if possible, above the nearest joint. Others object to the practice, on the ground that such wounds are disposed to end favourably without amputation, and that the state of the system does not admit of the operation being done with the best prospect of success.

But when the operation is not done, an irregular wound of this description requires considerable incisions for the extraction of foreign bodies, for the discharge of matter, and for the purpose of shortening the projecting muscles and tendons; measures, which produce as much, and even more pain and irritation, than amputation, without equal good. If a few cases can be cited, in which patients with shattered stumps survived, with the parts firmly healed †, a much larger number has occurred, in which this reluctance to operate had the most fatal consequences. The surgeon may the more readily make up his mind to amputate, as the loss of a limb is not in question.

With respect to amputating above the nearest joint, this must depend in a great measure on the distance of the injury from the articulation; no one would think of amputating above the knee, when the injury is near the ankle.

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* Medical Sketches of the Campaigns of 1812, 1813, 1814, &c. p. 207. 8vo. Dedham, 1816.

† Some years ago, Mr. Weir, the late Director-General of the army medical department, pointed out to me a soldier, in the York hospital, who from the appearance of his stump, had had his arm as well taken off by a cannon-ball as it could have been by the knife.

CHAP. XX.

OF POISONED WOUNDS.

As poisoned weapons are not made use of by civilized nations, and venomous animals are not numerous in this country, our opportunities of seeing poisoned wounds are but limited. The bites and stings of insects; accidental pricks and cuts, received in dissection; the bites of adders; and those of rabid animals; are the chief cases. Of these, only the two last will be noticed in this volume.

BITE OF AN ADDER.

The poison of this reptile is lodged in capsules, at the roots of two moveable fangs in its upper jaw, which, when the animal bites, are directed perpendicularly downwards, and the venomous fluid, being then compressed out of the capsules, flows through the grooves of the fangs directly into the bitten part.

The effects of the bite on the human subject usually take place with great rapidity. An acute pain, and a burning sensation, are immediately experienced in the part, which soon begins to swell. The pain, heat, swelling, redness, and tension quickly extend a considerable distance from the punctures, frequently affecting the whole limb, on which livid spots make their appearance. In some cases, the pain is not confined to the limb, or parts in the vicinity of the injury, but affects the viscera and other remote organs. Dejection of spirits; alarming syncope; a frequent, small, concentrated, irregular pulse; difficulty of breathing; cold profuse sweats; confusion of vision, and of the mental faculties; vertigo; prostration of strength; headach; nausea and a convulsive vomiting of bilious matter; followed almost always by a general yellowness of the skin, and sometimes by pain about the navel; are the symptoms usually denoting the operation of the poison of the viper on the whole constitution. When the case ends fatally, a kind of gangrenous inflammation of the cellular membrane, the sort of disease lately described under the name of diffuse inflammation of the cellular substance, and noticed in the chapter on erysipelas, is generally produced in a greater or less degree. In this country, the bite of an adder seldom proves fatal to man, and, according to Fontana, the danger of the injury is commonly in proportion to the smallness of the animal that receives it. Hence, children suffer more indisposition from the bite, and more frequently die from its consequences, than adult persons, as is proved by certain facts published by M. Paulet.* The same author likewise refutes Fontana's statement, that the bite never kills a grown up person, of which event, indeed, some examples have been known in Great Britain. Another fact, which he explains, is, that of the more perilous effect of the poison on animals already weakened by disease, than on those in a healthy state; in illustration of which observation, he records the case of a horse, which being bitten on the cheek, while in an enfeebled condition, died of the accident in eighteen hours. The activity of the poison is described by all writers as greatest in hot weather, and the effects of the bite are remarked to be generally more rapid, the nearer the injury is to the heart, and the quicker the circulation of the blood at the time of its reception.

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* Obs. sur la Vipère de Fontainebleau, 1805.

The treatment consists of local and constitutional means: by the former, we endeavour to prevent the absorption of the venom; by the latter, we strive to avert the ill effects of absorption, if it should take place, and appease the bad symptoms, when they have come on.

The application of a ligature round limb, above the bite, with the view of impeding the entrance of the virus into the circulation, was a plan, which Fontana, as well as Paré, found particularly useful. The objections to this practice are founded on the inconvenience, and even danger of mortification, likely to result from the long-continued constriction of the limb. It may also be supposed, that after the removal of the ligature, or tourniquet, the virus would still find its way into the circulation; but, if Fontana's statement be correct, this is not generally the case, and the fact may depend either upon the interruption of absorption produced by the inflammation, or upon some change effected in the virus during its lodgment in the part.

One of the most effectual plans for the hinderance of the absorption of the virus, is the excision of the bitten part. I should have more confidence in this treatment, than in attempting to destroy the part with the actual or potential cautery. Fontana's observation, however, that the bad symptoms, when begun, cease after amputation of the part, is at variance with what Russell has stated with regard to the serpents of India. The eau de Luce (a medicine resembling the spiritus ammoniæ succinatus) and olive oil are also celebrated local remedies for the bites of snakes. In order to form a correct judgment of their real efficacy, it must be recollected, first, that the bite of an adder rarely proves fatal, and the patient would generally recover with little, or even no assistance at all. Secondly, that the virus of the animal varies in its quantity and force, according to circumstances, and therefore its effects are sometimes but slight. Thirdly, that both the foregoing applications have repeatedly failed in averting the severity of the symptoms, whatever appearance of efficacy they may have had in other examples. In South America, the plant, named mikania guaco* is regarded quite as a specific for the bites of serpents. The plan is to chew it, and then lay it on the wound, the juice being used also as an internal medicine. An investigation into the real power of guaco by a committee of well-informed professional men, is at present a desideratum.

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* Humboldt and Bonpland, Plantes Equinoxiales, t. ii. p. 84. tab. 105.; also Orfila, Traité des Poisons, t. ii. p. 533. ed. 2.

The internal remedies, which have gained repute for their good effects in counteracting the operation of the venom of snakes, are, besides guaco already mentioned, ammonia, eau de Luce, olive oil, and arsenic. Six or eight drops of the liquor ammoniæ may be given in a little peppermint water, or a glass of sherry, every two hours. The dose of eau de Luce is a teaspoonful, which, if necessary, may be repeated every three or four hours. These two medicines, however, are not considered, in modern days, as deserving the name of antidotes for the bites of snakes, though they may be useful in preventing the syncope, prostration of strength, and mental dejection, apt to occur in such cases. The character of arsenic is supported by much better evidence; and according to some experiments detailed by Russell, and several cases recorded by Mr. Ireland, it seems actually to possess very considerable specific power in preventing, and even removing, the ill-consequences of the poison of various serpents. The formula used by Mr. Ireland, was ʒij. of the liquor arsenicalis, and ten drops of tincture of opium in ℥iss. of peppermint water, to which ℥ss. of lemon juice was added just before the medicine was taken. The same draught was repeated every half hour for four hours in succession. The inflamed parts were often fomented and rubbed with a liniment, composed of half an ounce of turpentine, the same quantity of ammonia, and an ounce and a half of olive oil. Cathartic clysters were exhibited as soon as the patients began to be purged, and the arsenic was discontinued.*

BITE OF A MAD DOG. — HYDROPHOBIA.

Of all the poisoned wounds, which happen in this country, the bites of certain rabid animals are the most dangerous, as they are apt to give rise to one of the most dreadful and incurable disorders to which human nature is liable. The rabies of certain animals, here alluded to, is described by writers as either originating spontaneously, or as being communicated to them by the bite of an animal already labouring under it. Whether it ever arises spontaneously in the human subject is a doubtful point; the cases adduced as proofs of it, being by no means free from ambiguity. Horses, mules, asses, horned cattle, pigs, and, still more frequently, foxes, wolves, cats, and dogs, are attacked by rabies. Although the infection may be received, and propagated by other animals, it probably never originates in any except those of the canine race. † The hydrophobic poison, I believe, can only produce its terrible effects on the human constitution by inoculation, that is to say, the virus, which is blended with the saliva of a rabid animal, must either be introduced into the cutis by a bite, or be applied to a scratch, cut, or excoriation. As these slight injuries are frequently unnoticed, or forgotten by persons who have been handling infected dogs and cats, and the illness of the animals themselves is also not even suspected, we cannot be surprized, that the idea of the disease sometimes having a spontaneous origin in man, should thus receive countenance. In consequence of the virus being mixed with the saliva of the rabid animal, when a person is bitten through a boot, or other thick clothing, the chance of infection is lessened, inasmuch as there is a possibility of the poison having been completely wiped from the teeth in their passage through the leather, or other clothing. Hence, also, bites of the naked face, and of the fingers and hands, unprotected by gloves, are reckoned particularly dangerous, and alledged to be in general not only more frequently followed by hydrophobia, than bites of other parts covered by the clothing, but to be also sooner followed by it.

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* See Med. Chir. Trans. vol. ii. p. 393.

† See Hillary on the Diseases of Barbadoes, p. 246.

The human race seems much less susceptible of the infection than dogs. Four men and twelve dogs were bit by the same rabid dog; all the dogs died rabid; but the four men escaped, though they used no other means of prevention, than such as we see every day fail. On an average, not more than one person out of sixteen bitten, takes the distemper *; an important fact to be remembered in judging of the true merit of any preventive methods of treatment.

From an experiment made by Majendie and Breschet, it seems that the saliva of a hydrophobic patient is capable of communicating the disorder to dogs by inoculation. † The same thing has been repeatedly tried in England, without any effect.

The interval between the infection and the commencement of the disease varies considerably in different instances. Out of 131 cases, only three patients took the disease before the eighteenth day; none before the eleventh; from the eighteenth to the thirtieth, seventeen were seized; sixty-three began to be ill from thirty to fifty-nine days after the bite; twenty-three were attacked from two to three months inclusive; nine from three to four months; two at five months; one at five months and eleven days; one at six months; one at seven months; two at eight months; one between eight and nine months; two at nine months; one at eleven months; one at fourteen months; two at eighteen months; and one at nineteen. To cases happening beyond this last interval, Dr. Hamilton attaches no credit. ‡ One case, related by Dr. Bardsley, on the other hand, seems not to have commenced till twelve years after the bite. § The most frequent time, for the beginning of the symptoms, is about six or seven weeks after the accident.

A dull heavy pain first takes place about the wounded part, the cicatrix of which sometimes becomes red, or even festers, and dis-

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* See Hamilton on Hydrophobia, vol. i. p. 31.

† Orfila, Traité des Poisons, t. ii. p. 529. ed. 2.

‡ Hamilton, vol. i. p. 113.

§ Mem. of the Literary and Philos. Society of Manchester, vol. iv. part 2. p. 431.

charges a thin red ichor. When the bite has been in the hand, the pain shoots up to the shoulder and neck, and not particularly to the axilla. A gloom is diffused over the spirits, accompanied with listlessness and anxiety. The patient becomes timid and distrustful, sleeps unsoundly, and often courts solitude. In a few cases, the distemper begins with a paroxysm of shivering. The night is passed in restlessness; the appetite begins to fail, and some thirst is experienced: now the peculiar symptom, which gives the disease its name, the dread of liquids, is discovered, often accidentally, on the patient attempting to take drink.

There are a few cases which cannot, with accuracy, be said to have any melancholy stage; the pain about the wounded part, and the difficulty of swallowing liquids, being preceded by no loss of spirits, nor any kind of mental despondency.

The patient is not only unable to swallow liquids, he cannot behold them without terror, nor hear them mentioned without disgust. This fear, however, is not the result of a mental aversion to fluids; but is the consequence of the insufferable sensations which the attempt to swallow them, or even the sound or sight of them, produces. When the patient attempts to drink, he immediately sobs in a convulsive manner, experiences a dreadful choaking pain, and is seized with general convulsions. Patients have tried to drink with the firmest resolution; but on the liquid approaching their lips, the intolerable disorder excited, baffled the endeavour. * If, with great suffering, a little drink is swallowed, it is sometimes immediately vomited up again, tinged with bile. † This symptom, hydrophobia, then, is not a delirious dread, or allucination of the mind; but a matter of experience, which at first surprises the patient himself. ‡

Even shining surfaces, which reflect the light, as water does, are sometimes to hydrophobic persons intolerable. This was not the case, however, with the poor woman, who died in the summer of 1808, in St. Bartholomew's hospital; for, she made use of a looking glass, without any inconvenience.

But the dread of swallowing liquids, although the most singular symptom, constitutes but a small part of this distressing malady. The mind and body are affected with extreme irritability, and excessive susceptibility to all impressions. Hence, the constant watching and inquietude; the impatience and sudden fits of anger from trivial causes; the distress and the violent paroxysms brought on by such circumstances as the slightest motion of the air, the shutting of a door, the buzzing of a fly, &c. Hence, also, the patient's timidity and incessant apprehensions, and the occasional fits of delirium and incoherence, from which he quickly recovers.

In this disease, the fauces are always oppressed with a large quantity of a thick, tenacious mucus, and, as the patient cannot swallow even his own saliva, he is continually spitting it out.

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* Marcet, in Medico-Chirurgical Trans. vol. i. p. 158.

† Mem. of Manchester Society, vol. iv. p. 439.

‡ See Mead on Poisons, p. 146. edit. 3.

The degree of mental derangement differs greatly in different examples; in some it hardly exceeds great irritability and impatience; in others, it amounts to muttering and incoherent talking, with rational answers to questions; and, in a few, it rises into short fits of the most ungovernable rage and fury, the patients biting and tearing themselves, and every thing near them.

At length, the muscles of deglutition are more continually affected with excruciating pain, which gradually extends itself to the diaphragm, and abdominal muscles. The convulsions become more violent, and the fits of suffering more frequent, the patient's countenance is full of horror, and his eyes look red and furious. Sometimes, the patient, notwithstanding such symptoms, retains his senses to the last.

The duration of life, after the commencement of the symptoms, varies from thirty-six hours to five days, very rarely to six.

The difference between rabies canina and tetanus, is not invariably such as to prevent the latter from being mistaken for the former. Tetanus is mostly occasioned by slight wounds of the fingers, toes, or other tendinous parts. It does not commonly begin till some time has elapsed after the injury, and, perhaps, the wound is healed. It is marked by violent paroxysms of general spasm, which begin about the throat and neck, and are accompanied by a difficulty, or inability of swallowing. These spasms are excited by the most trivial causes; for, merely attempting a change of posture, endeavouring to swallow, or even to speak, will sometimes produce a renewal of spasms over the whole body.* Tetanus and rabies canina also mostly end fatally about the fourth day. Some cases must be exceedingly difficult to discriminate. Dr. Bardsley describes an instance, where a slight injury of the finger, with a splinter of wood, was followed, in about a week, by spasms of the lips, locked jaw, and paroxysms of general spasm. On the third day, after the attack, the young gentleman could not swallow any watery fluids, nor bear them to be brought near him, without fresh and more violent attacks of spasm being thereby induced. Another similar case arose from the bite of a horse. In both these examples, a recovery took place.†

In tetanus, the spasms generally come on sooner after the local injury, than those of rabies canina; the jaw is rigidly locked, and the muscles of the neck and back are particularly affected; the muscles are more unremittingly contracted than in hydrophobia, their action only abating for a time in degree; there is less fever, less quickness of pulse, and less thirst; and the extreme anxiety and irritability of mind, which accompany rabies canina, do not prevail.‡

The name, hydrophobia, has certainly led to much confusion, because it creates an idea, that the most essential and distinguishing symptom of rabies canina, is a dread, or difficulty, of swallowing fluids. The symptom hydrophobia is far from being peculiar to canine madness: it has occurred in typhus fever, tetanus, hysterics, variolous sore throat, inflammation of the stomach, pleurisy, peripneumony, St. Vitus's dance, &c.* Neither is the dread of liquids an inseparable symptom of rabies canina.†

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* Cullen's First Lines of Physic, vol. iii. Chap. on Tetanus.

† Mem. of the Manchester Society, vol. iv. p. 477.

‡ Rees's Cyclopædia, art. Hydrophobia.

As no medicine, hitherto discovered, is capable of infallibly counteracting the baneful effects of the canine poison, practitioners are strongly called upon to impress on the minds of the patient and his relations, the necessity of doing whatever is most likely to prevent the constitution from being affected.

As a preventive, surely nothing is more rational, nothing is so forcibly indicated, as the excision of the part bitten immediately after the accident. In all poisoned wounds, the adoption of other steps to prevent the system from being affected, is inferior to the obvious efficacy of this measure, which, the sooner it is practised, the greater must be the chance of success from it. When the operation has been neglected at first, it ought yet to be done; for there is reason to believe, that it may answer, not only several days, but several weeks after the bite, and, indeed, at any time before the symptoms have actually begun.

Were a person to receive a bite close to a largish artery, like the radial, one fatal instance of which fell under my own notice, I am of opinion, that, if the animal from which the injury was received, were undoubtedly rabid, the part ought still to be cut out, even though the operation might not be practicable without removing a portion of the vessel itself. When the bite extends very deeply, so as to render the complete excision of it impossible, some writers recommend amputation; but it is a practice rarely adopted, on account of the severity and mutilation attending it.

If excision be not practised, the other less certain measures for the prevention of infection, are the application of the actual or potential cautery, particularly caustic potassa, quicklime, muriate of antimony, nitrous acid, or the moxa. Bathing the wound with chlorine, or hydro-chloric acid, and keeping it covered with linen wet with this medicine, which is also given internally, is another practice, in favour of which, some cases published by Brugnatelli, deserve attention. The dilatation of the wound, and the application of cupping glasses to it, as well as the plan of keeping up a discharge from it for a considerable time, may likewise be mentioned.

Various specifics for the prevention of rabies canina have been extolled, though generally without sufficient proof of their real efficacy. No modern practitioner has the least confidence in the pulvis antilyssus of Dr. Mead; the famous Tonquin medicine; or the Ormskirk remedy. Neither does cold bathing, or rather half drowning the patient in the sea, retain as many advocates as it did in former times. With regard to the most powerful articles of the materia medica, I may say, that they have all been repeatedly tried, and as repeatedly found ineffectual; musk, ammonia, opium, belladonna, stramonium, hyosciamus, arsenic, æther, the nitrate of silver, and mercury in every possible form.

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* See Mead on Poisons, p. 147. Sauvage's Nosol. Method. Edinb. Med. Essays, vol. i. p. 222 and 227. Ferriar's Med. Hist. and Refl. vol. iii. p. 24—26. Rees's Cyclop. loco citato.

† Hildanus, Obs. 88. and Mead on Poisons, loco citato.

That cases may be found in the annals of medicine, intended to prove the efficacy of these and other remedies, as preventives, must not be dissembled; but, they are all of a questionable and inconclusive description; because, in general, before any preventive remedy is tried, the wound is well washed, or some other means taken to free it from the virus. In this circumstance, the latter measures may be the cause of any benefit really obtained. Hydrophobia also only happens in a small proportion of patients, who are bitten by animals truly rabid, and, be it recollected, that these are frequently not rabid when vulgar report describes them as being so.

After the system is affected, the methods of treatment, yet entitled to further trial, seem to me to be, first, the practice of venesection until the pulse can scarcely be felt, as successfully adopted by Schoolbred and Tymon in the East Indies. At the same time, I ought to mention, that, in Europe, such treatment has not hitherto answered the expectations once raised by the reports of its efficacy in Asia. Secondly, the external and internal use of chlorine, or the hydro-chloric acid. Thirdly, the injection of morphine, extract of opium, stramonium, laurel-water, belladonna, or simply lukewarm water, into the venous system, as suggested and tried by Magendie, Dupuytren, Breschet, Brandreth, and others; though, as yet, only with a partial and temporary relief of the symptoms of some of the cases. Whether this plan of trying the effect of powerful remedies, introduced directly into the veins, instead of into the stomach, will lead to the discovery of an antidote for hydrophobia, further experience can alone decide. The bite of a viper has been sometimes tried. Although I strongly recommend perseverance, and would not on any account discourage the boldest experiments in so desperate a case, truth obliges me to say, that, as far as our present knowledge of their results extends, there is nothing yet established, that can justify us in lessening our opinion of the high importance of preventing the disease by the early excision of the bitten parts. In Russia, the cauterization of vesicles, discernible under the tongue in an early stage of the case, and the exhibition of a drachm of the powder of genista, three times a day, are said to have prevented and even cured the disease.

CHAP. XXI.

CONTUSIONS

Are produced by the impulse of a blunt, hard surface against the body, the skin remaining unlacerated. The consequences are, a diminution of the tone of the injured fibres, and a rupture of an infinite number of small vessels. The bruised muscles are weakened, and cannot be exerted without pain; and the extravasation of blood causes swelling, and a black and blue discolouration of the skin, termed *ecchymosis.* Sometimes vessels of considerable size are ruptured, and a copious effusion of blood under the integuments is the result. In contusions of the head, we often see the scalp enormously elevated by hemorrhage beneath it, and large collections of blood are frequently found extravasated in the cellular substance of almost every situation in the body.

Violent contusions not only affect parts, on which the force immediately falls, their effects reach those which are remote from the place directly struck. The second sort of contusion is what the French term a *contrè-coup*, in which the injury is to be imputed to the effect of a very powerful concussion.

The ill-consequences of a bruise are not always proportioned to the force applied; but sometimes depend on the nature of the injured part. If the bruise take place on a bone, thinly covered with soft parts, the latter always suffer very severely in consequence of being wounded, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores.

Slight contusions may be considered as occasioning only a weakness, and a degree of extravasation in the part, which may be rubbed once or twice a day, with the linim. saponis comp., or be covered with linen moistened with vinegar, cold water, brandy, lime-water, solutions of alum, or of acetate of lead. The bowels should also be opened with a dose or two of salts. When muscles are bruised, they ought to be relaxed and kept perfectly quiet, nothing being more conducive than quietude to the restoration of their proper tone.

When the contusion is of a more violent description, and the quantity of extravasation is considerable, bleeding, and other evacuations, together with the use of leeches, are proper. The topical applications should be mildly stimulating, and, consequently, such as are calculated to promote the action of the absorbents. Muriate of ammonia, dissolved in equal parts of vinegar and water, or the liq. ammon. acet. forms an excellent lotion. When the inflammation has subsided a little, liniments containing camphor may be used.

In cases, in which there is no danger of serious inflammation, and the chief indication is to promote the absorption of extravasated fluid, bandages act very beneficially, by the remarkable power which they have, of exciting the action of the lymphatics. It is best, however, not to employ them too early.

It is surprising, what large collections of blood will sometimes take place about the shoulder, and under the scalp, in consequence of bruises. Many surgeons would be induced to puncture such swellings, and let out the extravasated fluid. Without condemning every instance of this practice, I have no hesitation in pronouncing it to be in general hurtful. In ordinary cases, under the use of discutient lotions, and aperient medicines, the blood is rapidly absorbed. But, when an opening is made, the admission of the air to such blood as cannot be pressed out, makes it putrefy; febrile symptoms arise; the part is often attacked with an erysipelatous redness; and extensive abscesses, sloughing, and death have been the too frequent consequences.*

Should the distention, however, threaten to bring on sloughing, every one must coincide in the propriety of discharging the blood by an incision. I have seen many cases, in which the whole scalp was prodigiously raised and distended by blood, effused in consequence of a blow: but, generally, in about a week, the swelling entirely disappeared, with the aid of bleeding, purging, and the lotion of vinegar and muriate of ammonia.

From the observations and cases, published by Pelletan, it appears, indeed, that a puncture may sometimes be advantageously made in collections of extravasated blood; but, only after discutient means have had a fair trial, and the tumour has existed a considerable time.†

The putrid decomposition of extravasated blood, great local irritation, an erysipelatous affection and sloughing of the part, severe febrile symptoms, and death, sometimes take place, in consequence of the inflammation arising from the violence of the contusion; for, when the parts unavoidably slough, or suppurate, from the degree of injury inflicted, the sloughs and matter become blended with the effused blood, and, in this circumstance, the latter fluid inevitably putrefies.‡ Here an external opening should be promptly made, and even this will not avail, unless the contents be completely discharged. It matters not, whether the external opening, in a collection of extravasated blood, be made by accident or design: putrefaction of such portion of this fluid, as cannot be discharged, and the severe effects already hinted at, are the consequence.

Besides cases, in proof of the foregoing statements, Pelletan has related others, tending to show, that, when the whole of the extravasated blood can be completely discharged, and the sides of the cavity can be so effectually compressed together as to exclude the air, the making of an incision may sometimes prevent bad symptoms, instead of inducing[*] them. It is acknowledged, however, that, if an opening is made, and the blood cannot be entirely evacuated, nor the cavity obliterated by compression, such practice leads to a putrefaction of the part of the blood left behind, and does much harm. I must leave it to the experienced surgeon to decide, whether it is generally in our power to discharge, thus completely, every particle of extravasated blood, especially in recent cases, where that fluid is not contained in one cavity, but is widely diffused in the interstices of the cellular membrane.

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* Several cases, illustrative of the evils arising from an external opening, are detailed by Pelletan, in his Clinique Chirurgicale, tom. ii. ; Mem. sur les Epanchemens de Sang, p. 161, &c.

† See Clinique Chirurgicale, tom. ii. p. 150, 151. Cases 10 and 11.

‡ Vide Pelletan in the Memoir above referred to, p. 159, &c.

In cases, where extravasated blood putrefies, and the whole cannot be discharged, Pelletan[†] suggests, whether it may not be proper to counteract the process, by introducing into the cavity alcoholized or acid injections, &c. I can conceive, indeed, that, by chemical means, we might stop the putrefactive process in the effused blood; but, the irritation of these injections, on the living and highly inflamed parts around, no doubt, would do more mischief than the putrid blood itself.

Amongst the examples of contusion, in which the utility of making an incision for the discharge of extravasated blood appears to be decidedly acknowledged, I may mention those, which are improperly called wind-contusions, the nature of which is pointed out in the chapter on gunshot wounds.

CHAP. XXII.

ULCERS.

By some surgical writers, an ulcer is defined to be a solution of continuity in the solid parts of the body, accompanied with the discharge of a purulent fluid. According to this definition, the term *ulcer* is synonymous with the words *sore*, *suppurating wound*, and *open abscess*. By others, the word is restricted entirely to those solutions of continuity, from which an ichorous, sanious, or vitiated matter is discharged, attended with a loss of substance in the part. Although Professor Thomson thinks more favourably of this definition than of the former, I cannot help expressing a decided preference to the first, for the very reasons which this judicious surgeon has himself suggested.[‡] If we object to calling suppurating wounds, and such abscesses as have burst, ulcers, as long as they discharge healthy pus, what particular reason is there for approving of their receiving this name only when the matter from them happens to be of a bad quality? The healthy or unhealty state of the discharge from a sore or abscess is an accidental circumstance, depending upon the favourable or unfavourable condition of the parts to admit of the process, by which they are to be healed. If the preceding capricious method of defining an ulcer were to be sanctioned, every ulcer would cease to be so called as soon as the discharge from it presented the appearances of healthy pus; nor could there ever be any such ulcer as that, which has usually been described under the name of the simple healthy ulcer. It seems to me, that, in a general sense, we may consider sores or ulcers of every description, as chasms or breaches more or less gradually formed in the substance of the body, by a process, well known by the name of *ulceration*, in which the absorbents of the part remove the old particles back into the system more quickly, than the new ones are laid down by the secerning arteries. Ulceration does not invariably spread by that kind of destruction of the parts, where no remnants of the destroyed portions are left. Sometimes portions of organs, about to be destroyed, are observed to slough, and mortification is then partly concerned in extending the destructive process. Such cases are less frequent, however, than other instances, in which we know that a considerable extent of parts has been destroyed, without any remains of them being perceptible. Surgeons have endeavoured to discover the physiological reason of this curious fact; and an explanation is offered, which supposes that nutrition ceases in the ulcerating parts, while the destructive function of the lymphatic system, absorption, still proceeds.* Sometimes, however, the destruction of parts, the actual loss of substance, is only apparent; as, when a sore is the consequence of a simple incised wound, that has not united by the first intention, and continued for a greater or lesser time unhealed. Here we have sometimes the appearance of a cavity, from the retraction of the parts; but none of the flesh has been in reality removed, either by the accident itself, or by any subsequent action of the absorbent vessels. An ulcer, resulting from such a cause, is different, therefore, in respect to the process by which it is formed, from another sore, in which a chasm is truly produced in the part by ulceration. Also, when an ulcer is the consequence of mortification, and the separation of the sloughs, the process by which the loss of substance is occasioned, is very different from what happens in other cases, in which, any chasm that may exist, has been wrought by the activity of the lymphatic vessels. However, even in the instance of sores resulting from mortification, the latter vessels are somewhat concerned, inasmuch as it is by them that the uniting medium between the sloughs and living flesh is removed, and the dead parts loosened, so as to admit of separation. With regard to open abscesses, which have become what are customarily named sores, I think there can be no doubt of their being strictly entitled to this name, because here it is the process of ulceration, which always thins the superincumbent skin, and produces in fact the opening by which the matter is discharged. When the abcess has been opened with a knife, however, before the ulcerative process has commenced for the establishment of a spontaneous aperture, the case is then not essentially different from any other sore arising from an incised wound, in which some particular causes impede direct union, and create a necessity for the more circuitous manner of healing, by means of the granulating process. The truth is, in all the foregoing cases, whether sores, suppurating wounds, open abscesses, or large raw cavities left by the separation of sloughs, the parts can be healed only by one and the same process,—the formation of granulations; and the principal differences between them are derived from the consideration, that, in suppurating wounds and abscesses, there is not always essentially a loss of substance, which must, of course, attend every other sore, which is the consequence either of ulceration or sloughing. If the preceding view of things be allowed, and suppurating wounds, especially those of a certain standing, be considered as ulcers, then, of course, I see reasons for not agreeing with Dr. Thomson, that the words "attended with loss of substance" will increase the correctness of the definition, any more than Callisen's expression does, "solutio continui in partibus organicis *lente* exorta," &c.* The accuracy or inaccuracy, however, will depend upon the rejection, or not, of the suppurating surfaces of old wounds from the cases regarded as ulcers. Were the term *ulcer* entirely restricted to the effects of the process of ulceration, then, of course, loss of substance, and the gradual manner in which the solution of continuity has been produced, would be essentials in the definition.

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[*] Vide Pelletan in the Memoir above referred to, p. 192—211.

[†] Ibid. p. 237.

[‡] Lectures on Inflammation, p. 426.

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* Delpech, Précis des Maladies reputées Chirurgicales, t. iii. p. 594.

The usual causes of ulcers may be said to be abscesses, which have burst, or been opened; wounds which have not healed by adhesion, but continued a certain length of time suppurating and indisposed to heal with facility and readiness; various surgical operations in which the knife has been employed; the separation of mortified parts; different kinds and forms of external irritation; and internal constitutional diseases, many of which are of a specific nature, as scrofula, lues venerea, the scurvy, &c.

The division of ulcers into *constitutional* and *local*, true and natural as it is, is to be received with an understanding, that many sores, which at first depend entirely upon internal causes, and are in the beginning of a specific nature, are often changed so much in their nature before cicatrization is completed, that, in their latter stage, they are strictly only local ulcers; while many other sores, which are at their commencement only of a local nature, quite unconnected with internal causes, afterwards change with any change or affection of the general system, and become, in every sense of the expression, constitutional ulcers.

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* Systema Chirurgiæ Hodiernæ, vol. i. p. 379.

The prognosis generally depends, first, upon the nature of the cause, and the facility or difficulty of its removal; secondly, upon the kind of parts attacked, whether of great importance or not in the animal economy; and thirdly, upon the patient's age, constitution, and mode of life.

The steps which nature takes in the healing of sores, I have endeavoured to describe in the chapters on wounds. With respect to the art of surgery, it is its province to remove and diminish the causes from which an ulcer has originated; to prescribe a proper regimen, quietude, advantageous posture, and the best dressings. It is only in *compound* and *constitutional ulcers*, that any necessity commonly arises for internal medicines. This term of *compound* is applied to sores, in which the cure is retarded by any complication not existing in what is understood by a *simple* or *healthy ulcer;* and such complication may be either internal or external. Of the former we have a specimen in a scorbutic ulcer; of the latter, in a sore which is prevented from healing by hurtful and improper applications.

Ulcers present themselves in very various forms, but I think it sufficient, in this elementary book, to consider five kinds: viz. the *healthy*, the *irritable*, the *indolent*, the *varicose*, and the *specific*.

1. SIMPLE, OR HEALTHY, ULCERS

Secrete white thick pus, which does not adhere to the surface, and their granulations are small, and florid, with rather pointed tops. As soon as the granulations have risen to the level of the surrounding skin, those next the old skin become smooth, and covered with a thin semi-transparent film, which afterwards becomes opaque, and forms cuticle.

An ulcer, answering this description, is in a healing state, and the surgeon can only be useful by keeping the surrounding skin clean, applying soft scraped lint to absorb the redundant quantity of matter, and covering this simple dressing with a pledget of any unirritating ointment, with a view of preventing evaporation from the surface of the sore, a thing which would lead to the formation of a scab, and often change the favourable condition of the ulcer.

A roller will frequently promote the cure, as it not only serves to retain the dressings, and as a kind of defence to the sore, but also to support the muscles and skin, which are frequently loose and flabby, from the want of the natural exercise of the limb.

I shall presently have occasion to speak of Mr. Baynton's plan of dressing old ulcers of the leg, with long circular strips of adhesive plaster. This method is now not confined to old ulcers, but often adopted with the greatest advantage in cases of simple healthy ulcers upon the lower extremities.

2. IRRITABLE ULCERS.

Irritable ulcers cannot always be known by their appearance, though, in many instances, they can be so discriminated. A sore will invariably partake very much of the nature of the constitution, and when this is known to be irritable, the local complaint will often be so. A surgeon, however, is frequently quite unaware of this quality of an ulcer under his care, until, perhaps, at the end of a little time, not finding the sore heal sufficiently quick, he ventures to apply some stimulating application, or to roll the bandage round the limb more tightly, than at the previous visits. The next day, he is mortified to find, that his patient has passed a miserable night, and that several discoloured sloughy parts have formed on the surface, and also at the circumference of the sore. At other parts, the granulations have been rapidly absorbed, and whatever matter lies on the surface of the ulcer, is diminished in quantity, and of a blackish, fetid quality. When the excellent plan of treating many ulcers, recommended by Mr. Baynton, was first introduced, I saw much mischief result from its being indiscriminately applied by dressers to this kind of ulcer.

Some appearances at once denote the irritable nature of an ulcer. When the margin of the surrounding skin is jagged, and terminates in a sharp undermined edge; when the bottom of the ulcer is made up of concavities of different sizes; when there is no distinct appearance of granulations, but only of a whitish spongy substance, covered with a thin ichorous discharge; when touching the surface causes pain, and frequently hemorrhage, the sore may be set down as of an irritable description.

Irritable sores are particularly often situated over the lower end of the fibula, the anterior surface of the tibia, and ligament of the patella.

The applications to irritable ulcers should be of the sedative kind. The steam of warm water acts very beneficially on them. A warm decoction of poppy-heads, applied every morning and evening as a fomentation, by means of flannels, is highly useful. The extract of hemlock, or opium, dissolved in hot water, makes a good fomenting liquor.

Emollient poultices may be employed as the continued application, and that made of linseed is the best. It is frequently found serviceable to lay immediately over the surface of the sore, under the poultice, lint dipped in a solution of opium (℥iss. to ℔j. of water). When the weight of the poultice seems to have a bad effect, the lint wet with the above lotion may be covered with a pledget of simple ointment.

The carrot poultice, particularly when made by boiling the vegetable, and beating it into a pulp, deserves to be noticed as a remedy, which agrees with many irritable sores.

Powdered carbon and cream have also obtained repute for their good effects.

It is of great use in these cases, to have a choice of remedies; for those which agree at first generally lose their virtue after being used a certain time, and it becomes necessary to have recourse to others. Thus six or seven different applications may all have a period at which they are productive of benefit. The pressure of bandages is always pernicious.

3. INDOLENT ULCERS.

The appearances of indolent ulcers are the very reverse of those characterizing irritable sores. The edges of the surrounding skin are thick, prominent, smooth and rounded. The granulations are smooth and glossy, the pus is imperfectly formed, and blended with flakes of coagulating lymph, which adheres so firmly to the surface of the ulcer, that it can hardly be wiped away. The bottom of the sore forms almost a level, and its general aspect gives the idea of a portion of the skin, and parts underneath, having been for some time removed, and the exposed surface not having commenced any new action to fill up the cavity.*

This is the most genuine indolent ulcer. In other cases, the appearances bear some resemblance to those of that opposite kind of sore, the irritable ulcer.

Indolent ulcers form the majority of those which are to be seen in the large hospitals of this metropolis. Their granulations are endued with a weak living principle, and are very apt to be suddenly absorbed without any assignable cause.

When poultices are improperly applied a long time to indolent ulcers, the chasms will be filled up with large, loose, pale, glossy granulations, which would never acquire the power of forming a durable cicatrix, if the same relaxing treatment were to be continued. These weak unhealthy granulations, when stimulated by topical applications, undergo a considerable change, becoming smaller, more compact, redder, and free from their glossy appearance, and the cicatrix, which follows, is more apt to continue healed, than when the sores have been healed by relaxing applications.

Solutions of lunar caustic, touching the surface of the ulcer with the caustic itself, diluted nitrous acid, the unguent. hydrarg. nitrat., and the unguent. hydrarg. nitrico-oxydi, and supporting the sore and the neighbouring skin and muscles with a roller, were the usual means employed for healing common indolent sores. Bandages have also been found particularly serviceable to such ulcers. The laced stocking was formerly much used, and strongly recommended by Wiseman. As Dr. Thomson remarks *, however, it is in appearance only that this mode of bandaging in ulcerated or varicose legs, has any advantage over that with a common circular roller. The use of the circular bandage, with dressings composed of the unguentum resinæ, and the red oxyd of mercury, in different proportions, was some years ago recommended in a particular manner to the attention of the English public by Dr. Underwood. † He allowed his patients to go about their ordinary occupations under this mode of treatment; first, because it was inconvenient for many of them to be confined; and, secondly, because it was found, that the cicatrices of many patients, whose ulcers had healed up during rest, broke out again as soon as the limb was exercised. The treatment of ulcers with bandages, or fine flannel rollers, somewhat less than four inches wide, also found a very zealous advocate in Mr. Whately. ‡ In his cases, very little variety of dressing was employed, and, with a few exceptions, pressure was principally relied upon as the means of cure.

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* Home's Practical Obs. on the Treatment of Ulcers on the Legs, &c. Edit. 2. 8vo. 1801.

But of all the improvements, which have of late years been introduced into the treatment of old indolent ulcers of the legs, that which was first proposed and practised by Mr. Baynton of Bristol, is by far the most important.

It consists in applying strips of adhesive plaster round the limb, so as to cover the sore. The strips of plaster are to be two or three inches broad, and long enough to surround the limb, and leave an end about four inches long.

The middle of the strip so prepared, is to be applied to the sound part of the limb, opposite the inferior part of the ulcer, so that the lower edge of the plaster may be placed about an inch below the edge of the sore, and the ends are then to be drawn over the ulcer with as much gradual extension as the patient can well bear. As many strips are to be applied in this manner as will cover the whole surface of the sore, and one inch of the limb below and above it. Soft compresses are to be laid over the part, and the limb is to be rolled from the toes to the knee, with calico bandages.

The affected parts are then to be kept moist with cold spring water, which enables the surgeon to remove the strips of plaster without hurting the patient, and, at the same time, keeps off inflammation. §

The advantages of this method are now fully confirmed by repeated trials; the prominent edges of the sore become levelled; the opposite sides are approximated, so that the cicatrix is rendered smaller than it would otherwise be; the patient can be cured while

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* Lectures on Inflammation, p. 447.

† Treatise upon Ulcers of the Legs, &c. 3d edit. 1799.

‡ Practical Obs. on the Cure of Wounds and Ulcers of the Legs, without Rest. 8vo. Lond. 1799.

§ See a "Descriptive Account of a New Method of Treating Old Ulcers of the Legs," by T. Baynton. Edit. 2. 1799.

walking about; and the new-formed cicatrix is stronger, and more likely to continue sound, than after the old method of treatment.

4. VARICOSE ULCERS.

Varicose ulcers, or such as are connected with a varicose affection of the neighbouring veins, mostly occur either on the inside of the leg, near the ankles, or on the instep. Their size and number vary in different cases: their edges are indurated, high, and callous; the sores are painful when touched, and exhibit a brownish red colour, which spreads a good way beyond the circumference. The limb is habitually affected with a kind of swelling, that is always rendered worse by much exercise and long continuance in the erect posture, and better by rest and the horizontal position. In the vicinity of the ulcer, small varicose tumours are observable, which are sometimes insulated, sometimes connected together in clusters. * The varicose ulcer, described by Sir Everard Home, has the look of a mild, indolent sore, attended with a varicose state of the trunk and branches of the vena saphena. The sore is seldom deep, and is usually of an oval shape. The case is attended with a deep-seated pain, extending up the limb in the course of the veins. The difficulty of healing varicose ulcers, and their tendency to break out again, are generally acknowledged.

A reference to the history of surgery presents us with four methods of treatment. 1. Topical applications. 2. The destruction of the varices. 3. Compression. 4. The operation of tying the trunk of the vena saphena at the back of the knee.

1. With respect to topical applications, I need only state, that all kinds have been frequently tried, and as frequently found ineffectual.

2. Former surgeons having experienced the difficulty of healing these sores, began to pay more attention to the varices in the vicinity. These were now considered as keeping up the disease, and, it was inferred, that if they could be destroyed, a cure would speedily follow. Their removal was chiefly attempted in three ways. 1. By excision; a plan which, instead of doing good, sometimes occasioned another incurable sore. 2. By tying the vein above and below the dilatation, and then discharging the contained blood by a puncture. 3. By caustic, and the cautery. I need not detain the reader with an exposition of the well-founded objections to all these means.

3. Compression is one of the best modes of curing varicose ulcers. The advantages of the laced stocking for varices were known to Fabricius ab Aquapendente, Wiseman, and Scultetus; and so were those of dog-skin, which, on account of its elasticity and suppleness, is a very fit material for a compressive bandage. The common roller, however, is the thing generally employed, the limb being compressed with it equally from the foot to the knee. With a

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* See Œuvres Chirurg. de Desault par Bichat, tom. ii. p. 517.

bandage thus applied, over a simple dressing, the generality of varicose ulcers may be completely cured.[*]

4. In cases which resisted compression, Sir Everard Home practised an operation, which consists in tying the trunk of the vena saphena, as it passes over the knee-joint. The patient is to stand on a stool of a convenient height; the integuments are to be pinched up into a transverse fold, and divided; and a ligature is to be conveyed under the vein with a bluntish silver needle. The vessel becomes impervious where the ligature is applied, and the obstruction serves instead of a valve, to take off the weight of the column of blood.[†] Having seen this operation followed, in several instances, by severe symptoms[‡], I soon began to apprehend that it would fall into disrepute. Others have even known it prove fatal[§], and the practice is now abandoned by the best surgeons of this metropolis. Instead of this operation, another was proposed by Mr. Brodie, which has been often practised without any of the severe consequences common after the preceding method. It was suggested by the consideration, that the veins divided in amputation seldom inflame upon their inner surface, while the extension of inflammation far along the vessel towards the heart, in the instances where the vena saphena had been tied, seemed to be the cause of all the severe and fatal symptoms. Hence, Mr. Brodie conceived, that it would be safer to cut the vein completely through, leaving, however, the superincumbent portion of skin undivided, a thing easily accomplished with a narrow, sharp-pointed, slightly curved bistoury, the edge of which is on its convexity. The point of the knife is passed between the skin and vein, until it reaches beyond the vessel. In doing this, the blade is kept with one of its flat surfaces turned towards the integuments, the other towards the vein. Its edge is then to be directed backward, and, by withdrawing the instrument, the requisite division of the vessel is effected.[||] I am not acquainted with any examples in which Mr. Brodie's plan of operating has been followed by very bad symptoms, but two cases are detailed in a late work[¶], in which the vena saphena major was exposed, *by dividing the skin*, and then cut across; the hemorrhage was easily stopped with a compress, but severe constitutional derangement followed, and both the patients died. To these reflections we must add another one, in relation to the use of the knife, and of ligatures for the cure of varicose ulcers, viz. that the obliteration of a part of the tube of the vena saphena major, by these means,

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[*] Œuvres Chir. de Desault par Bichat, tom. ii. p. 518.

[†] See Home on Ulcers, Varicose Veins, &c.

[‡] See also a case in Hodgson's Treatise on the Diseases of Arteries and Veins, p. 551.

[§] See London Medical Review, vol. ii. p. 356. Oldknow, in Edinb. Med. and Surg. Journ. vol. v.; and Surgical Essays, by A. Cooper and B. Travers, p. 216, &c. 8vo. London. 1818.

[||] Brodie, in Medico-Chir. Trans. vol. vii. p. 195, &c.

[¶] Hodgson on Diseases of Arteries and Veins, p. 555—558.

does not always ensure the patient from a return of the diseased vessels to their former state, with all the pain and inconveniences experienced previously to the operation. This arises from other veins, which run parallel to the saphena, becoming enlarged after the ligature of it, and thus rendering the operation unavailing. Perhaps, simple pressure and a horizontal position are yet the safest, and best, means of curing and relieving varicose veins and ulcers.

5. ULCERS WITH SPECIFIC ACTION.

By a specific ulcer, is implied one which is complicated with some peculiar morbid action, owing to the state of the constitution, or to the disposition of the part affected. The varieties of such ulcers are almost numberless, and baffle description. Scrophulous and venereal sores are specific; cancer, and lupus, or the noli me tangere, are also of a specific nature. Some of the inveterate ulcers, into which many venereal sores change, after the syphilitic action has been destroyed, are probably specific: they are mentioned in the chapter on the venereal disease.

Ulcers occur on the instep and foot, with a very thickened edge, and a diseased state of the surrounding skin, very similar to elephantiasis in appearance. Sir E. Home observes, that he has several times met with them in the servants of opulent families, who had led indolent lives, and lived freely.* In cases of this sort, he recommends the hydrargyrus sulphuratus ruber to be used as a fumigation. In some instances, an ointment composed of calomel and hog's lard, or of the ung. hydrarg. nit. mixed with camphor, is said to answer better than any other application. According to the same authority, a class of irritable ulcers, situated in the vicinity of the ankle, attended with enlargement of the joint itself, and surrounded with a degree of thickening, are much benefited, by poultices and fomentations, containing the conium maculatum (hemlock).

There is a kind of ulcer, which does not extend more deeply than the cutis, but spreads in all directions. The specific morbid action does not continue in the parts which have ulcerated, but only affects the edge of the skin where the ulcer is increasing; for, the surface first affected heals, while the parts beyond are in a state of ulceration. For such ulcers, of which there are several varieties, a solution of the argentum nitratum is the best application.

The last specific ulcer which I shall here notice, is the *fungated* one. It is seen on the calf of the leg and sole of the foot, shooting out a fungus from the surface. The new-formed substance is extremely broad, and narrow at its root; it is tender, and bleeds from very slight causes. The disease in its origin, somewhat resembles a scrophulous affection of the metatarsal bones, until the skin ulcerates, and the fungus protrudes.

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* See Practical Obs. on Ulcers of the Legs, by Sir. E. Home, p. 299. 2d. Edit.; and Hodgson on Diseases of Arteries and Veins, p. 560.

One species of this ulcer contaminates the lymphatic glands in the course of absorption; another kind does not do so. The first case cannot be cured by the internal and external use of arsenic; the second may.

CHAP. XXIII.

ENCYSTED TUMOURS

Are composed of a cyst, in which is contained a matter, extremely various in its appearance and consistence. Sometimes it is soft; sometimes quite fluid; and, in other instances, hard, and even ossified. When it is of the latter kind, the cyst occasionally bursts, and the indurated contents gradually protrude, so as to cause the appearance of a horn. In St. Bartholomew's hospital, I once saw a complete horn removed from the scrotum by Sir J. Earle: its formation and growth perfectly corresponding to the foregoing statement.

In the British Museum is preserved a curious specimen of a horn, which grew from a woman's head, and, in all probability, was formed by a process similar to that which I have mentioned. In Sir Astley Cooper's possession is a still more remarkable specimen, which was given to him by Dr. Roots, and which, in shape and size, bears a close resemblance to a ram's horn! It also grew from the head, and had been preceded by a smaller horny excrescence, about three inches long, which fell off spontaneously. In the removal of the larger one, Dr. Roots was careful to remove the whole of the cyst, and no return of the disease ensued.*

When the contents of an encysted swelling are fluid, like honey, the tumour is named *meliceris*; when of a pappy quality, *atheroma*; when fatty, *steatoma*. The feel of an encysted tumour is soft or hard, according to the nature of its contents, the consistence of which, however, cannot always be ascertained by the touch, especially when the cyst is exceedingly thick, firm, and elastic, like parchment or cartilage. It usually contains only one cavity, which is occasionally intersected by partitions. Steatomatous tumours are sometimes composed of distinct contiguous cysts, which may be easily separated from each other. Atheromatous swellings on the head and back usually have very thick firm cysts: while the cysts of similar swellings on the face are generally much thinner.

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* See Surgical Essays by Sir A. Cooper and B. Travers, part ii. p. 234. In the Phil. Trans. vol. lxxxi. p. 95. &c., may be seen an interesting paper by Sir E. Home, explaining the manner, in which certain horny excrescences are produced.

Encysted tumours are mostly situated immediately under the skin, but, occasionally, they form in deeper situations. Those of the steatomatous kind frequently attain an enormous magnitude. Ordinarily, they are not at all painful. At first, they are constantly moveable, and probably would continue so, if all external pressure were kept from influencing them; but, in time, they generally become more fixed, in consequence of being adherent to the skin and subjacent parts. According to Sir Astley Cooper, a dark coloured spot may often be noticed on the skin in the centre of the tumour, in an early stage of the disease, and such spot he describes as the sebaceous matter obstructing the orifice of a cutaneous follicle; the circumstance, to which his observations lead him to ascribe the origin of the swelling.*

Many persons have a pre-disposition to encysted tumours: more than twenty have been met with in one patient†, and particular families are much troubled with them. Such swellings are common enough in most parts of the body; but, on the head, they occur with particular frequency. I have seen them oftener in this situation, than any other. Mr. Hey has noticed the frequency of atheromatous tumours upon the heads of adults. He had seen the scalp almost covered with them. In children, the atheroma often occurs on the face, forming tumours about the size of a pea, which are smooth, and appear rather whiter than the skin. These, after a time, inflame and burst, the contents are discharged, and the part commonly heals. Hence, the complaint is generally left to take its own course. When such atheromatous swellings take place, as they often do on the eyelids, and particularly, when they are near the eyelashes, they may excite ophthalmy, and occasion opacity of the cornea. Hence, their extirpation is the most prudent measure. The late Mr. Hey used to make an incision into them, in the direction of the fibres of the orbicularis muscle, press out the contents, and then extract the cyst with a pair of forceps.‡

Encysted swellings have sometimes been dispersed by strong discutient applications like brine, the lotion of muriate of ammonia, &c.; but, this success is very rare. Even if it were in our power more frequently to bring about the absorption of what is contained in the cyst, this itself would still remain, and its extirpation be requisite. §

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* See Surgical Essays, part ii. p. 230—236, &c.

† Practical Obs. on Cancer, by J. Howard, p. 2.

‡ Practical Obs. in Surgery, p. 517, 518. Edit. 2.

§ Some very good observations on the general inefficacy of internal and external medicines, for the removal of encysted swellings, and on the advantages of an early recourse to the scalpel, have been published by Loder. See his Chirurgisch-Medicinische Beobachtungen, Erster Band, p. 205. et seq. 8vo. Weimar, 1794.

Another practice has consisted in letting out the contents of the swelling by a puncture, and then obliterating the cavity of the cyst by pressure. But there is always some risk in irritating encysted tumours, and cases are to be met with in the records of surgery, proving, that such diseases are, in this manner, very capable of being converted into fungous and inveterate ulcers, as bad as carcinoma.*

However, from cases, referred to by Sir Astley Cooper, one or two of which he was so polite as to show me, it appears, that many encysted tumours, which have a black spot, or little aperture in their centre, may be prevented from becoming larger, and giving any serious trouble, by merely introducing a probe occasionally into the opening, and pressing out the contents of the swelling.†

The common mode of removing encysted tumours, consists in dissecting them out, without wounding the cyst. If the latter accident occur, the contents frequently flow out, the cyst collapses, and the continuance of the dissection is attended with more difficulty. It is also a great desideratum to remove every particle of the cyst, and, hence, it is satisfactory to take it out entire, that is, without wounding it. When any portion remains behind, the wound will frequently not heal, in consequence of the growth of fungous granulations from it. Unless the swelling be large, a single incision through the skin is sufficient, but, in other instances, it is advantageous to make two cuts in this manner (); first, because they facilitate the removal of the tumour; secondly, because they prevent a redundance of skin which might serve as a lodgment for matter.

After the operation, the edges of the wound are to be brought together with sticking plaster, and a compress and bandage applied.

Instead of the usual method, Sir Astley Cooper prefers making an incision into an encysted swelling, and then pressing its sides together, so as to evert the cyst, when its removal is easily completed.

CHAP. XXIV.

GANGLIONS.

A GANGLION is a small hard tumour, unattended with pain, and composed of a cyst, which is of a firm tendinous texture, connected with a subjacent tendon, and filled with a fluid resembling the white of an egg. It is usually more or less moveable beneath the skin; its growth is slow, and it is seldom much larger than a hazel-nut. Its figure is commonly round, smooth, and even; it seldom inflames, and still more rarely does it suppurate; but, when the latter event happens, an ill-conditioned ulcer is generally produced.

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* See Abernethy's Surgical Works, vol. ii. p. 115. 119.

† See Surgical Essays, part ii. p. 239.

Ganglions occur most frequently on the hands and fingers, and either over a tendon, or ligamentous expansion, with which the sac is connected underneath. But, there are instances of these tumours making their appearance in many other situations, and they sometimes attain a considerable magnitude. A ganglion has been known to cover the whole back part of the neck.* These tumours appear sometimes to be the consequence of a bruise, or violent sprain. Occasionally they move along with the tendon, to which they are attached; while, in other instances, they seem fixed.

Deformity, and impediment to the use of some particular muscle are the utmost inconveniences commonly resulting from this disease, but when the tumour ulcerates, a very foul, and even dangerous ulcer may be the result.†

The common plan of treating ganglions is to apply pressure, or stimulating applications to them, with a view of causing them to be absorbed. Binding a piece of lead on the tumour with a roller, is an usual method; and, when the stimulating plan is preferred, the oleum origani, or hartshorn, may be used as a linament. The two methods are frequently practised together. Many ganglions may also be reduced by blisters kept open directly over them. It must be acknowledged, that these modes of treatment are frequently tedious, and the benefit produced by them too often only temporary.

Supposing, however, all attempts to disperse a ganglion ineffectual, and the parts to be disabled, in consequence of the size and situation of the tumour, ought the surgeon to advise the extirpation of the disease? According to my judgment, he ought; for daily experience proves, that accidental wounds of tendons and ligaments commonly terminate well, and that ganglions may be safely cut away, when they are obstinate and troublesome, is fully proved by numerous cases.‡ Here it as necessary to remove the whole of the cyst, as in a case of ordinary encysted tumour.

An effectual method of curing ganglions is to strike them with the back of a book, &c. so as to rupture the cyst, and cause the contents to be diffused in the adjacent cellular substance. I have known many instances of the success of this practice, which is frequently adopted by Sir Astley Cooper.§

When other plans fail, Sir Astley Cooper sometimes lets out their contents with a needle, and he has never seen inflammation, or any serious consequence excited by such practice.[*] Dr. Currie also cures them by drawing the skin to one side, and then making an oblique opening into the cyst with a couching needle, so that the contents of the swelling may be pressed into the cellular membrane. A compress and bandage are then applied; and, if necessary, the operation repeated after a few days.[†]

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* Cases in Surgery, by Joseph Warner, p.163. edit. 4.

† See Medical Journal, vol. v.

‡ See Warner's Cases, p. 165. 170. edit. 4. Gooche's Chirurgical Works, vol. ii. p. 376. Heister's Institutions of Surgery, part ii. chap. 171.

§ See Medico-Chirurgical Transactions, vol. ii. p. 339.

CHAP. XXV.

SARCOMATOUS TUMOURS

Are so named, when they are not contained in regular globular cysts, like encysted swellings, and are of the consistence of flesh; being composed of various substances, which more or less resemble ordinary fat, the human pancreas, the mammary gland, the medullary matter of the brain, cartilage, the spongy texture of the gums, &c. However, in all these cases, it is only a degree of resemblance, since a tumour, really like the pancreas, the mammary gland, &c. in texture, is never met with. A very ingenious classification of tumours founded upon the likeness of their structure to that of particular organs, or, in other words, upon their anatomical structure, was some years ago published by Mr. Abernethy[‡], who employs the terms *common vascular*, or *organized sarcoma; adipose sarcoma; pancreatic sarcoma; mammary sarcoma; medullary sarcoma; cystic sarcoma; tuberculated sarcoma;* &c. according to the texture, which the swelling most resembles, or as it happens to contain cysts, or to consist of an aggregation of tubercles. All these and other varieties of sarcoma are found, not merely to differ in the appearances of their texture, when examined out of the body, but also in regard to their general progress, severity, and danger, while connected with the patient. Thus, the cases, named *common vascular sarcoma*, and *adipose sarcoma*, are simple diseases free from all malignity, occasioning but little pain, or inconvenience, except what arises from their weight, or pressure; but, several of the other kinds, especially the *tuberculated sarcoma*, and the *medullary*, now better known by the name of *fungus hæmatodes*, and described in a future chapter, are marked by their peculiarly intractable character, by a strong propensity to recur, and by an inseparable connexion with a certain diathesis, always tending to produce similar diseases in various parts of the body, and to destroy life. At all events, if there be any exceptions to this statement, they are very rare.

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[*] See Medico-Chir. Trans. vol. ii.

[†] See Edinb. Med. Journ. No. 84.

[‡] Surgical Works, vol. ii. p. 261, &c.

Scirrhus, and cancer, sometimes named *carcinomatous sarcoma*, are also distinguished by their malignity, and form the subject of the ensuing chapter.

Most of the varieties of sarcoma, may not only occur as distinct swellings in the midst of original textures, with which they even sometimes have but a slight connexion, but may take place in original parts themselves, which form as it were the frame-work for them, undergoing enormous changes in size, consistence, and even shape, though the primitive shape of the organ, always continues for a time to influence that of the swelling. Besides the classification of tumours, according to the resemblance of their consistence and texture to those of certain organs, and substances, with which the anatomist is familiar, the French have suggested another, founded upon the elementary tissues into which they may be finally resolved, in the same way as Bichat applied this mode of examination to the natural structure of the body. It is asserted, that all swellings are reducible to about seven morbid tissues, each of which has a peculiar structure, always presenting the same characters, whatever may be the part, in which it happens to be situated. Sometimes these textures are found unmixed; sometimes, blended and variously combined, to the number of two, three, or four. *

Fatty tumours, often termed also *lipomatous*, or *adipose*, are formed by an accumulation of fat in a limited, and generally very circumscribed extent of the cellular substance. The structure of adipose sarcoma is absolutely the same as that of the adipose substance, such as it appears to be in those situations where fat naturally collects; with this difference, however, that the interstices of the cellular membrane, thus affected, are of considerable size, and obviously enlarged. The integuments, which are distended, and rendered much thinner than natural, constitute a sort of sac, spread over the mass of fat, of which the tumour is composed, nothing appearing to be interposed between them and the swelling itself, if we except a very thin capsule, that is slightly connected with the substance of the tumour by means of many small vessels. There are some cases, where the partitions of cellular membrane, forming the cavities in which the fat is deposited, are thicker, and more compact, than in the natural state; and when a section is made of such a tumour, the exposed surface presents a marbled appearance, of a yellow and white colour.

Fatty swellings are frequently of an oblong pyramidal shape, and have a narrow pedicle, which is itself of a fatty texture; but, sometimes they have a base, which is as broad as the whole mass of the tumour. They are met with in persons of all ages; but are most frequent in adults. The shoulders, the back, and the neck are particularly common situations for them. Their occurrence, however, is so frequent, that there are few surgeons who have not had opportunities of seeing them in almost every region of the body. They are disposed to grow to a very large size, which, however, they may not attain till after they have continued many years. Instances are recorded, in which they weighed after their removal, from forty to nearly fifty pounds. Particular individuals seem also to have a strong disposition to their formation, as is proved by the existence of many of them at once in different parts of the body, a remarkable specimen of which is described in Walther's publication.*

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* See Dict. des Sciences Med. t.iii. p. 340, where the names and other particulars of these tissues may be found.

Sometimes adipose tumours are formed in parts, in which there is naturally but a small quantity of fat: thus, in warm climates, the scrotum is often prodigiously enlarged by a deposition of fatty matter, and Delpech has seen a fatty swelling in the labia pudendi, the structure of which is very different from fat.† Sometimes adipose swellings are formed betwixt the peritoneum, and the parietes of the abdomen, in which circumstance the tumours make their way outwards under the integuments, drawing along with them the part of the peritoneum to which they are attached. Such cases are improperly named by some of the French writers "herniés graisseuses."

Adipose tumours generally grow in a regular, slow, and progressive manner; their vessels are neither large nor numerous. Hence their removal is attended with little danger from hemorrhage, and they are easily separated from the surrounding parts. When they have been inflamed, however, the detachment is more difficult.

The shape and slow growth of adipose tumours might suffice to indicate their nature; but they present other characters, amongst which the consistence of the mass of the swelling deserves particular notice. These tumours are not elastic, but have a peculiar soft feel, resembling what is perceived on handling a bag filled with cotton. Their surface is unequal; but the irregularities, which are distinguishable through the thin integuments, have no firmness, and are obliterated by compression. These circumstances, however, are only strongly marked in such adipose tumours as have not yet acquired an immense size, and remain free from every complication. When the swelling has become exceedingly large, its weight, its magnitude, its pressure on the surrounding vessels and integuments, materially obstruct the circulation, and œdema then taking place between the skin and adipose substance, the consistence of the latter may appear to be increased. A surgeon of experience, however, will yet be able to detect the inelastic softness, which is peculiar to all fatty tumours. Any previous attack of inflammation may also harden the parts around an adipose sarcoma, and even cause ulceration: a state, which should never be confounded with cancer.

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* Ueber die angebohrnen Fetthautgeschwulste und andere Bildungsfehler, p. 29. Fol. Landshut, 1814.

† Précis Elem. des Mal. Chir. t. iii.

Adipose tumours, though large, may continue a great many years, without producing any pain, or inconvenience, provided they remain free from irritation. They may grow with more or less rapidity, or may remain of the same size for a very long time; but they have never been known to disappear spontaneously, and (except in a few instances in which they have been made to slough and ulcerate by caustic and stimulating applications, a plan on every account to be reprobated) all attempts to disperse them invariably prove ineffectual.

Every kind of fleshy tumour, every enlargement of an original part of the body, can only be the effect of some change in the action in the vessels. Whatever matter is deposited in the interstices of a gland, or any other part, must be placed there by those secerning arteries, which, in the healthy state, secrete exactly a sufficient quantity of new particles to supply the old as fast as they are removed by the absorbents. Thus the action of the secerning arteries, and that of the lymphatics, ought to be equal; and whenever more matter is deposited by the blood vessels, than is taken away by the absorbents, a tumour forms in the disordered part. It is possible to conceive, however, that when original parts are enlarged the morbid change may be owing to an imperfect absorption, and not to any wrong action of the blood vessels. But in cases of tumours, which are quite distinct, and which constituted no original part of the body, the formation of the disease is probably always the result of a morbid state of the surrounding arteries.

The process by which sarcomatous tumours, and indolent indurations and thickenings, are formed, is sometimes referred to *chronic inflammation;* but, whether this doctrine be correct, or not, little or nothing is known about the causes of the growth of the generality of fleshy tumours. In fact, we know not what the particular circumstances are, which invariably precede and give rise to whatever change it may be in the action of the blood-vessels, or that of the lymphatics, which leads to the formation of a fatty, or fleshy tumour. We know not what it is that causes the secerning arteries to deposit too much, or the absorbents to remove too little. Neither do we understand, why, in one case, the swelling should consist of fat; in a second, of a fleshy substance; in a third, of medullary matter, &c. unless we be content with the explanation, that the cause depends upon diathesis, predisposition, &c. which is leaving things, in reality, unexplained.

It is usually supposed, that coagulating lymph is the first kind of matter, which is thrown out from the vessels, in the early stage of sarcomatous tumours; and that it afterwards becomes vascular itself, and is converted by the action of its own vessels into the various kinds of morbid structure already mentioned. In proportion as a tumour increases in size, it compresses the surrounding cellular substance, which is converted into a kind of membranous capsule. However, in sarcomatous cases, the cyst is generally thin; and, sometimes, there is even no cyst whatever.

The growth of indolent tumours does not disturb the constitution; they form in an insidious manner, without increased heat, and generally without any uneasiness in the part; and most of them are disposed to become gradually larger and larger.

Surgeons are not only ignorant of the particular causes of the growth of various fatty, fleshy tumours, they also know of no effectual means, by which the progress of the disease can be stopped, and the patient freed from the inconveniences of continually bearing about with him a mass of redundant matter, which in a chronic state is both a deformity and an oppression; in an inflamed or ulcerated state, is a source of severe pain and even of dangerous mischief; and in certain malignant forms, the frequent occasion of death, preceded by unusual sufferings. It has been conjectured that topical bleeding and cold applications would check the growth of sarcomatous tumours; but experience teaches us to place no dependence upon the plan. Attempts have also been made to promote the absorption of the new formed substance by means of mercurial frictions, blisters, electricity, and stimulating discutient applications. These methods, however, are not recommended by many examples of success; and they are attended with some risk of irritating the tumour, without lessening it, in which case the disease sometimes changes from an indolent quiet form to an irritable state, in which it inflames, enlarges, ulcerates, emits fungi, and assumes a character as intractable and dangerous as that of cancer itself. I believe, that the only kind of swelling, which does not present these risks, is the common adipose one: at least, I have never seen it change into a malignant disease. When local stimulating applications succeed, it is usually by their inflaming the whole swelling, and causing it to ulcerate and slough. This, however, when it answers, is on the whole a more severe method than extirpation with the knife, and often induces alarming constitutional illness, to which the patient sometimes falls a victim. I remember a man, who had a considerable sarcomatous tumour, extending from the angle of the jaw over the side of the neck; the late Mr. Ramsden, by means of stimulants and escharotics succeeded in making it ulcerate; but the disease now put on so aggravated an appearance, with incessant darting pain, fever, delirium, &c. that the patient did not live beyond three or four days from the period when the tumour began to ulcerate and slough.

For the reasons which have been explained, the practice of trying to disperse indolent sarcomatous tumours is not deserving of praise. The removal of the disease by the knife is the best measure, and the sooner it is done the better; for a common adipose tumour, now about the size of an apple, and capable of being extirpated with the utmost safety, may, in the course of a few years, become so large as to weigh from fifteen to twenty or thirty pounds; and the magnitude of the wound, necessarily made in cutting out so large a mass, may prove highly dangerous and even fatal. Besides, sarcomatous tumours, when removed in an early stage, are less apt to leave the surface of the wound complicated with any impediments to a radical cure.

When the tumour is known, at the time of the operation, to be either a mammary, a tuberculated, or medullary sarcoma, care should be taken to make a free removal of the surrounding substance.

The operation is performed in the same way as that of removing a diseased breast, to the chapter on which subject the reader is referred.

CHAP. XXVI.

OF CANCER.

In the present imperfect state of our knowledge of cancer, the greatest difficulty, in determining many of the most important questions concerning it, undoubtedly arises from one term embracing numerous forms of disease. While some authors confine the name of cancer to one kind of case, as, for instance, to a disease capable of contaminating other parts, either by direct communication, or through the medium of the absorbents, and when it approaches the skin, producing in it small tumours of its own nature [*], others have no scruple in calling nearly every induration a scirrhus, and every intractable ulcer a cancer. Nay, a splendid modern work has appeared, in which are minutely described the symptoms and characters of six different species of cancer, to each of which a particular name is assigned.[†] When different authors, therefore, are speaking of cancers, they are not always speaking of the same disease, and it is by this fact, that the discordant statements about the effects of remedies, and the possibility of a cure, are to be reconciled.

The cases adduced by Sir E. Home support the opinion, that cancer is at first entirely a local disease; a doctrine, however, about which the best authorities still disagree. They also tend to prove, that cancer is not a disease which immediately takes place in a healthy part; but is a distemper, for the production of which the part must have undergone some previous morbid change. Thus, pimples, small tumours, or warts, upon the nose, cheek, or prepuce, remain for ten, fifteen, twenty, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised, or otherwise injured, change into cancers. The same doctrine is also corroborated by the many indolent tumours of the breast, which remain quiet for years; but, on being irritated by accidental violence, become cancerous.

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[*] Home's Obs. on Cancer, p. 146. 8vo. Lond. 1805.

[†] See Nosologie Naturelle, ou les Maladies du Corps Humain distribuées par Familles, par J. L. Alibert. tom. i. p. 540, &c. fol. Paris, 1817.

Cancer is said to prevail in particular families, and is still regarded by some of the latest writers as an hereditary complaint.* We are not to understand, however, that this is so much the case, that because a mother has the disease, her children must necessarily be afflicted with it.

Cancer is rather a disease of old, than of young persons. Exceptions undoubtedly occur. Sir E. Home mentions an instance of cancer in the breast of a young lady aged fifteen. The true cancerous structure, however, is seldom seen under the age of twenty-five or thirty.† What used to be regarded as cancer of the eye, and is frequent in children, clearly appears from the observations of Mr. Wardrop to be, in reality, fungus hæmatodes of that organ. Cancer scroti, however, sometimes, but not commonly, presents itself in young lads.

Cancer is most prone to attack the female breast and the uterus. It seldom affects the breasts of the male sex, though I have seen one example that was supposed to be such; and also another case, which, though it resembled cancer externally, had not internally the carcinomatous structure; but, if possible, was a worse affliction, being complicated with a general disease of the glands, in the course of the abdominal aorta, which were immensely enlarged, and changed into a greenish substance, much like turtle. Cancer often invades the testes, lower lip, penis, and tongue, the skin, and other parts of a glandular structure. Though women are less frequently afflicted with cancerous lips, they are, on the whole, much more subject to cancer than men: a fact, accounted for by the change of the constitution at the cessation of menstruation, a change, found materially to promote its commencement, and by the uterus and mamma being the parts on which the distemper is most disposed to make its attack. In women, accustomed to menstruate in large quantity, the uterus is frequently attacked when that evacuation ceases. In unmarried females, and those who have not had children, the breasts often become the seat of the disease, about the same critical period. However, as Sir A. Cooper has remarked, pregnancy and suckling do not always prevent the complaint, of which he knew one woman die, who had been pregnant seventeen times, and had ten living children.*

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* Pearson's Principles of Surgery, ed. 2. p. 225. Alibert professes the same opinion, and mentions a lady who died of cancer of the uterus, whose mother and grandmother had both perished of the same disease. See *Nosologie Naturelle*, &c. t. i. p. 556.; also Bayle in Dict. des Sciences Med. t. iii. p. 677. Sir A. Cooper, in Lectures, vol. ii. p. 187.

† Wardrop on Fungus Hæmatodes, p. 189.

The disease is more malignant in some situations, than others. When it commences in the skin, its progress is said to be generally slower than when it begins in the mammary gland, and its effects on the health less rapid. Relapses are more common after the extirpation of a cancerous breast, than after that of a carcinomatous lip, or a scirrhous testicle. It is even said, that a part of a scirrhous tonsil may be left behind; and yet the circumstance will not hinder the patient from receiving material relief, since cancerous ulceration is, in this instance, not disposed to break out with ungovernable malignity, as usually happens when a portion of other cancerous tumours is left. I believe, however, that most indurations of the tonsil are not really scirrhous, but scrofulous.

According to M. Roux, the skin, cellular substance, mucous membranes, glandular secreting organs, and, perhaps, lymphatic glands, are the only parts capable of being primarily affected with cancer †; and though it is its nature to extend to a great many structures, this is consecutively and by propagation. Thus, it never begins in muscles, serous membranes, tendons, cartilages, &c.

Mucous membranes are more frequently the primary seat of cancer, than the skin. To this place must be referred such cancers of the eye as begin on the conjunctiva, cancers of the nasal cavities, tongue, œsophagus, stomach, bladder, uterus, penis, and rectum.

Cancer of glandular secreting organs is alleged by M. Roux to be more circumscribed than in any other structure, and this may be the case in the testis; but, in the mammary gland, the scirrhous structure, which will be presently described, soon branches out into the surrounding part of the breast, so that the limits of the disease cannot be so readily comprehended, as the mere feel of induration might lead us to suppose. According to M. Roux, cancer never first commences in the lachrymal gland, but extends to it from the eye; and the salivary glands are also never affected but secondarily. The breast and testicle, he says, are the only glands exposed to the primary attack of the distemper. In the two last organs, the disease is more constantly, than in mucous membranes, preceded by the state called scirrhus.

M. Roux believes, with Mr. Pearson, that cancer of the lymphatic glands is, perhaps, always a secondary affection. Mr. Wardrop, however, has seen two primary cancerous affections in lymphatic glands; similar cases have been met with by Mr. Abernethy ‡; and Klein once extirpated a very large original scirrhus of a lymphatic gland, situated upon the serratus major anticus, to which it adhered so intimately, that it was necessary to cut away a portion of the muscle with the swelling.*

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* Lectures, vol. ii. p. 186.

† Mémoire renfermant quelques Vues Générales sur le Cancer, in Œuvres Chir. de Desault par Bichat, t. iii.

‡ See Wardrop on Fungus Hæmatodes, p. 188.

In general, whenever the skin is near the focus of the distemper, it is in it that the first vestiges of the extension of the disease are manifested. The organization of the skin may already have suffered, and the surface of the tumour be ulcerated, while the whole swelling may still be moveable, and the disease not have extended itself at all to the muscles, or other subjacent parts.

When cancer affects organs covered with a serous membrane, the latter part is affected only in an advanced period of the disease. Thus scirrhus of the pylorus exists a good while, without the peritoneum being diseased. Cancerous affections of the testicle prevail a long time without the tunica vaginalis becoming affected.

The blood-vessels seem to withstand the ravages of all kinds of ulceration longer than other organs; a fact exemplified in cancer,† as well as other cases; for, through the fungous growth, produced in the imperfect attempt at cicatrization, frequently bleeds profusely from the slightest causes, hemorrhage is not often occasioned by the extension of the ulceration, not even when it denudes a considerable artery.

In a cancerous affection of long duration, the lymphatic glands with which the diseased part communicates usually swell. The same thing sometimes happens in the very commencement of the disease, while the part is only in the state of scirrhus. In cases of scirrhous breast, the axillary glands enlarge; but, it is remarked, that if the disease be on the sternal side of the nipple, the gland, just above the clavicle at the lower part of the neck, is hardened, as the disease is then extended by the absorbents, through the intercostal muscles, to the internal mammary absorbent vessels and glands.‡

In the majority of cancerous diseases, the skin has a yellowish or lead-coloured tinge, and is dry and scaly. In advanced cases, the bones are frequently deprived of a good deal of their organized part; the calcareous matter predominates in them; and they become so brittle, that they break from the patient's merely turning in bed; a fact, of which there are many well-authenticated examples on record.

Some patients soon fall victims to the disease; while others lead a long life of misery and suffering. A few individuals, in whom the distemper becomes almost stationary, suffer little more than the anxiety and disgust inseparable from it. The younger the patient is, in whom a truly cancerous disease occurs, the more rapid are generally its advances. When a scirrhous breast occurs in very old persons, it does not generally shorten life, or rather it is more correct to say, that they often live several years with it, and finally die of some other complaint.* The progress of the disease may be accelerated by an unhealthy residence, mode of living, painful emotions of the mind, wrong treatment, &c.

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* Chirurgische Bemerkungen, p. 262.

† Dict. des Sciences Med. t. iii. p. 549.

‡ Sir A. Cooper's Lectures, vol. ii. p. 178.

"Mental trouble," says a distinguished surgeon, "has the worst effects upon scirrhi: in consequence of this, I have seen a small indolent scirrhus, of twelve years' standing, enlarged to the size of an apple in three weeks, attended with intolerable shooting pains, and, in seven weeks, become an open cancer." † Hence, when once an operation is decided upon, he recommends it to be performed as soon as possible, as the fear of it is likely to produce, in a very short time, the worst consequences.

Many writers refer all the phenomena of a cancerous diathesis to a virus, which they suppose to be formed in the seat of the disease, and thence conveyed by absorption over the whole system; a doctrine, rejected by M. Roux on the following grounds:— the lymphatic glands are often affected, while the disease is only in the state of scirrhus, and before any matter is formed. Such glands are sometimes not affected for years after the existence of the disease; a circumstance that seems inconsistent with the notion of an active poison. We possess no proofs, that cancerous matter is infectious, when applied to a sound person, or capable of producing a disease similar to that by which it was formed. ‡ MM. Biett, Lenoble, Fayet, and Alibert, inoculated themselves with the ichorous matter which exuded from a horrible fungous cancer of the breast; but without any ill consequences. § Some surgeons have not thought it always necessary to remove, with a scirrhous breast, the axillary glands, when they are diseased, || and, no doubt, the swelling of such glands may sometimes be the mere effect of irritation or sympathy. I may observe, however, that this cannot be the case, when those parts exhibit, as they frequently do after their removal, the same scirrhous texture as the breast itself. M. Roux also argues, that if the symptoms of a cancerous diathesis depended upon the impression of a cancerous virus on our organs, it would matter little whether the poison originated in this or in that part, and cancers of the uterus and breast would not be sooner

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* Sir A. Cooper's Lectures, vol. ii. p. 185.

† Chr. Klein. Chirurgische Bemerkungen, p. 259. 12mo. Stuttgart, 1801.

‡ Pearson's Principles of Surgery, edit 2. p. 259.

§ Alibert. Nosologie, Naturelle, &c. p. 558.

|| "Once (says an excellent surgeon) I was obliged by a profuse bleeding to leave the operation unfinished, and not remove some very indurated axillary glands; but, during the treatment, they disappeared, a circumstance which their hardness did not allow me to entertain the least expectation of." *Chirurgische Bemerkungen, von Chr. Klein, p.* 263, 12*mo. Stuttgart,* 1801. I have lately heard of several instances, in which hardened glands in the axilla, left after the removal of diseased breasts, have subsided and given no trouble. I am far from meaning to say, however, that these glands should never be removed; on the contrary, I have seen the true scirrhous texture as strongly marked in them, after their removal, as in the mammary gland itself, whatever might be the mode in which it was extended to them.

fatal than those of the skin. Some women, reduced to the last stage of weakness, have been permanently cured by the removal of cancerous breasts.

If a cancerous virus existed in the constitution, M. Roux enquires, why does not cancer of other parts always follow the removal of those already diseased? Why do secondary operations frequently succeed? Why does the application of caustic to a livid fungous part of the wound, after the operation, sometimes completely prevent the threatened recurrence of the distemper.* Experience, I believe, will justify the explanation, given by M. Roux, of the cause of many relapses; namely, that the parts, in the vicinity of the cancerous affection, were, at the time of the operation, in a state of disorganization, though undiscoverable by the most attentive eye. The circumstances, revealed in the dissection of a scirrhus, also strengthen this explanation. But this mode of accounting for relapses should be qualified, as nothing is more certain, than that cancer often breaks out again in distant parts, and that its origin, though often excited by local irritation, must always be joined with some peculiarity of constitution, without which no kind of irritation will produce the complaint. Thus, when this diathesis prevails, the extension of the disease along the lymphatics, and to their glands, may be the consequence of simple irritation from sympathy, or from another kind of irritation, connected with the quality of something that is absorbed in the diseased part. This doctrine is quite independent of all theory about a specific cancerous virus, or its universal diffusion in the system.

OF SCIRRHUS, OR CANCER, PREVIOUSLY TO ULCERATION.

I have always considered scirrhus as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhus indurations may have been lessened.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease, the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath †, and in the breast, the retracted state of the nipple, generally accompanied with declining health, and a peculiar sallow complexion, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumour is a true scirrhus.

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* P. J. Roux, in Œuvres Chir. de P. J. Desault, par X. Bichat, tom. iii.

† In advanced cases of cancer in the breast, the disease is frequently not only adherent to the pectoralis major, and intercostal muscles, but even to the ribs. See Howard's Pract. Obs. p. 18.

But, the diagnosis is frequently more obscure. In some cases, scirrhus is moveable, and not fixed to the subjacent parts; and the disease may be indolent, without much pain, or without discolouration of the skin. In the female breast, the part first affected may be very small, and feel like a loose pea under the skin; in other instances, it may be more extensive and deeply situated. Neither is the swelling always irregular and craggy.

The pain of a scirrhous breast, which generally extends to the nearest shoulder, and often to the nerves of the arm, is commonly most severe a little before the period of the menses, by which evacuation it is lessened again.*

A scirrhous induration rarely happens in patients under thirty, and seldom acquires the magnitude, which the generality of other tumours are disposed to attain, when their growth is not interrupted. Other tumours, especially when they have not been inflamed, are commonly more moveable than scirrhi.

If we except fungus hæmatodes, other tumours do not involve every kind of structure, skin, muscle, cellular substance, &c.; and the integuments seldom become affected before the distention, produced by their size, is very considerable. In scirrhus cases, the skin soon becomes contaminated, discoloured, and puckered; and, in the breast, an early symptom is a retraction of the nipple; owing to the lactiferous tubes being drawn out of their course by the swelling. †

Some few tumours may be harder and heavier, than a few scirrhi; but, the reverse is commonly the case. In a scirrhus of the breast, the part affected is generally hard, heavy, and connected with the mammary gland; and, when moved, the whole gland moves along with it.‡ The nipple, besides being retracted, is also frequently inflamed and excoriated. The cellular membrane also becomes hardened, and little tubercles form in the absorbent vessels under the integuments. §

In parts which have become scirrhous, the structure usually consists of a very firm, light brown substance, intersected by membranous or ligamentous septa, which run in various directions. The membranous septa are more numerous, and of greater thickness in some cases, than others. A cartilaginous substance is occasionally mixed with this structure The whole structure sometimes resembles a piece of common cartilage, softened by maceration. Sometimes cysts, containing a serous fluid, are formed in scirrhi, particularly those of the tèsticle and breast; but they are also frequently absent. A substance, possessing the common characters of scirrhus, has been known to be converted into a kind of bony matter. || When a section of a scirrhus is made in an

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* Sir A. Cooper's Lectures, vol. ii. p. 177.

† Ibid. p. 178.

‡ Obs. on Cancer by Sir E. Home, p. 156.

§ Sir A Cooper's Lectures, vol. ii. p. 178.

|| Dr. Baillie in a letter inserted in Adams's work on the Cancerous Breast.

early stage, the centre is found more compact, harder to the feel, and of a more uniform texture, than the rest of the tumour, and is nearly of the consistence of cartilage. This middle part is not larger than a silver penny; and from this are seen white ligamentous bands, passing to the circumference of the disease, in every direction, like rays. In the interstices, between these bands, the substance is different, and it is less compact away from the centre. Transverse ligamentous bands, of a fainter appearance, are likewise perceptible, forming a sort of net-work, in the meshes of which the new-formed substance is enclosed.

When the disease is further advanced, the whole mass has a more uniform structure; no central point can be distinguished; the external edge is more defined; and the ligamentous bands are more visible, running with great irregularity.

When the disease has proceeded to cancerous suppuration, which, however, does not invariably precede the formation of an outward sore, a small irregular cavity it found, filled with a bloody fluid, and having ulcerated, jagged, and spongy sides. Beyond these there is a radiated appearance of ligamentous bands; but the tumour near the circumference is more compact, and consists of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

In some instances, there is no appearance of suppuration, or ulceration, in the centre of a scirrhus; but a cyst is found filled with a transparent fluid, and having a fungus projecting into the cavity.*

The most characteristic mark of a scirrhus is this intersection of its structure with white ligamentous bands. It is to be regretted, that the existence of such texture cannot be detected till the disease has been removed. Every surgeon should be well apprised, that these membranous septa frequently extend a good way into the surrounding fat; for, the circumstance dictates, in the strongest manner, the necessity of removing a considerable portion of the substance at the circumference of every scirrhous swelling.

Sometimes cysts, of moderate, or very minute sizes, containing a transparent fluid, and supposed by Dr. Adams to be hydatids, are found in the substance of scirrhi; but such cysts are not so frequently attendant on the complaint as to form any essential part of its character.† Cancer may also arise under conditions, in which there cannot possibly be any hydatids concerned; for example, when a wart is torn off, and a cancerous sore is the result, the ulcer is only situated at the base of the excrescence, where there is never any hydatid. Himly ‡ and Mr. John Burns § have never been able to detect in cancerous parts any thing like hydatids; and Meckel * makes nearly the same declaration.

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* Sir E. Home, p. 157—159. Also Baillie's Morbid Anatomy; Abernethy's Surgical Works, vol. ii.; and Meckel's Handbuch der Pathol. Anatomie, Bd. 2. Abth. 2. p. 338.

† Home, p. 160.

‡ Dissert. on Inflammation, vol. ii. p. 445. 8vo. Glasgow, 1800.

§ Journ. der Prahtischen Heilkunde, 1809. st. 12. s. 126.

The dilatation of the superficial veins around scirrhous swellings is not peculiar to them; but attends many other tumours.

OF CANCER IN THE STATE OF ULCERATION.

The time when a scirrhus ulcerates is very uncertain; sometimes a long time, even many years elapse before this change occurs; and sometimes it never happens at all, the patient dying with the complaint still in the form of scirrhus. However, the diseased skin, covering a carcinomatous tumour, generally ulcerates before the swelling is very large. A large chasm is then produced in its substance, partly by sloughing, and partly by ulceration. A copious discharge of very fetid, sanious matter follows. The ulcer becomes irregular in its figure, and unequal on its surface. The edges are thick, and indurated, and often have a serrated appearance, being sometimes retorted, at other times inverted. The ulcer sometimes spreads with rapidity to a great extent, and the fungous mass, generally soon formed, is the source of frequent hemorrhages, which, joined with the irritation of the disease, reduce the patient to the lowest state of debility. Granulations are generally formed on the ulcerated surface, when the ravages of the disorder seem to undergo a temporary stop; but this apparent attempt at reparation only ends in the formation of an inveterate fungous substance. The surface of the sore feels hard, like the original tumour, and is remarkably insensible of pressure. In some places, the granulations rise up considerably; while, in others, scarcely any at all are produced; but they always differ from common healthy granulations in their hardness, their insensibility, and their secretion, which is generally a bloody serum. †

Generally, while the skin remains free from ulceration, though the health may be seriously disturbed, and severe attacks of pain be occasionally felt, the patient is not dangerously reduced; but no sooner does ulceration take place, than an immediate deterioration of the health is noticed. However, this sudden change does not constantly happen, much depending on the quickness or slowness of the disease, its situation, magnitude, &c. However, sooner or later, in every case, after ulceration has taken place, the countenance changes for the worse; debility, loss of appetite, a cough, with tightness of the chest, and difficulty of breathing, come on; the bowels are sometimes constipated; sometimes relaxed; and very distressing sickness and vomiting affect many patients, who at length sink into extreme emaciation and weakness. ‡

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* Handbuch der Pathologischen Anatomie, Bd. 2. Abth. 2. p. 355.

† Sir A. Cooper's Lectures, vol. ii. p. 179.

‡ Howard, p. 25.

The time when the lymphatic glands become affected, is subject to great variety. Carcinoma of the breast is most apt to contaminate the axillary glands, several of which becoming diseased, the function of absorption cannot be duly carried on in the arm, so that, in bad cases, the hand, forearm, and, in time, the whole of the limb, up to the shoulder, are swelled with an incurable kind of œdema. Occasionally, the lymphatic glands towards the clavicle are the only ones affected; and, in a few instances, those towards the sternum are alone diseased. In advanced cases, the disease mostly extends to the pectoral muscle. Instances are also recorded in which the cancerous disease of the breast extended to the pleura and lungs.* The pressure of a diseased lymphatic gland on one of the axillary nerves may cause excruciating agony. A fever has been known to occasion a mortification of a cancerous breast, and, had the sphacelus embraced all the contaminated parts, and the patient been less reduced, it seems probable that a cure might have followed. † The celebrated Mademoiselle Contat is said to have been suffocated by the tumefaction of the cellular substance about the throat, in consequence of an enormous cancer of her breast. ‡

TREATMENT OF SCIRRHUS AND ULCERATED CANCER.

The treatment of scirrhus embraces two objects; first, the dispersion of the tumour, or induration, by means of internal and external medicines, diet, &c.; secondly, the extirpation of the diseased parts with caustic, or the knife.

With respect to the dispersion of any truly cancerous tumour, that is to say, one in which the really scirrhous texture exists, I am decidedly of opinion, that it is a thing which is never accomplished; and that if the benefit to be derived from an operation be put out of consideration, such disease is incurable, and for the most part fatal. The cases, forming an exception to this general truth, are said to be three. 1. Not only true scirrhi, but even ulcerated cancers, have been known to be so extremely slow in their progress that they have lasted an immense number of years, without having apparently contributed to the abbreviation of life. 2. Mortification, which is one of the occasional fatal terminations of cancer, may sometimes, though very rarely, prove a means of cure. The whole of the tumour has been known to separate by the effects of gangrene, and the ulcer thus produced speedily heal up, like one of a simple nature.[*] 3. Another event, still more rare, is the actual cicatrization of an ulcerated cancer, while the subjacent scirrhous mass has not been destroyed, either by gangrene or any surgical operation.[†] But I may observe, that if such change were to take place, the patient could not be considered out of all danger, because the remaining scirrhus might ulcerate again, or even prove fatal, without being converted into an open cancer.

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* Hist. d'une Résection des Côtes et de la Pleúre lue á l'Acad. Royale des Sciences de l'Institut de France le 27 Avril, 1818, par le Chev. Richerand: in Nouv. Journ. de Médecine, Chirurgie, et Pharmacie, par Beclard, Chomel, &c. tom. ii. Mai, 1818. See also the account of a case which was in the Hotel-Dieu at Marseilles, where "not only the whole breast was destroyed, but also the axillary glands, the surrounding cellular substance, the pectoral muscles, and some portions of the ribs; so that when the patient died, the pleura costalis, much thickened, formed the bottom of the ulcer in several places." See Dict. des Sciences Med. t. iii. p. 548.

† For cases proving the foregoing statements. See Obs. on Cancer by Sir E. Home, pages 55. 59. 64. 76. 86. 91.

‡ Alibert Nosologie Naturelle, ou les Maladies du Corps Humain distribuées par Familles, p. 543. fol. Paris, 1817.

Dr. A. Monro, senior, appears to me to have shown more discrimination than many of his cotemporaries, when he gave it as his opinion, that the resolution of a cancer was a very rare occurrence; but that, as he had seen two swellings of this nature, or *at least what he supposed to be such*, cured, he would not take upon himself absolutely to deny its possibility[‡]. Certainly it would be unphilosophical to assert, that the resolution of a cancer is utterly impossible; but if a single well-authenticated example of it amongst several thousands of cases cannot be found, at all events, such a termination may be regarded as not in the natural course of things, and we should act, just as if it were altogether impossible.[||]

When the hardness is so situated as to be easily removed with the knife, no delay should be occasioned by attempting to disperse a swelling of this nature, because an early operation affords the best chance of effectual extirpation. The means, employed in the endeavours to disperse a true scirrhus, are tedious in their operation, often injure the health, and when of an irritating nature, and incautiously applied, convert the tumour into a cancer. The operation can be prudently postponed, and discutient remedies tried, only when doubts exist of the disease being a true scirrhus, with the peculiar texture already described.

There are various diseases of the breast, which somewhat resemble cancer; and besides encysted tumours, and different sarcomatous swellings, mentioned in a former chapter, surgeons frequently meet with other affections, which may be mistaken not only for an indolent scirrhus, but even for the painful form of this complaint, and ulcerated cancer itself. If the true nature of such cases be not ascertained, we may suppose, when we are treating only a simple chronic inflammation, or some other benign form of disease, that we are treating a really cancerous complaint, and ascribe to the virtues of the medicines a cure, which would frequently be produced by nature alone. These mistakes have had as much influence, as credulity and quackery have had, in conferring a temporary reputation upon specifics for cancer. Were these milder diseases also not discriminated, we should be continually giving unnecessary alarm by pronouncing them to be scirrhi, and even perform needless operations. Some of these examples, however, though free from malignancy, cannot be cured without the knife.

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[*] See Bulletin des Sciences Médic. par la Société Méd. d'Emul. Cahier de Dec. 1810, et Sept. 1811.

[†] Dict. des Sciences Méd. t. iii. p. 555., and Obs. de M. Nicod in Bulletin de la Faculté, &c. No. I. ann. 1810.

[‡] Edinb. Med. Essays, vol. v. art. 32.

[||] Dict. des Sciences Med. t. iii. p. 556.

1. In young women under thirty, one breast is often rather larger and more tender than the other, especially about the period of the menses. When, in such persons, this evacuation is by any cause considerably checked, or suppressed, one or more indurations may form in one or both breasts.

This case is described by Sir A. Cooper, under the name of the *irritable tumour of the breast*, on account of its great tenderness and painful nature. The uneasiness extends to the shoulder and axilla, and frequently down the limb to the fingers. When the pain is most severe, vomiting is produced. The skin over the part retains its natural colour. The same experienced surgeon states, that the disease is frequently attended with profuse, or scanty menstruation, and often with fluor albus. Its causes he refers to irritability of constitution, and a wrong state of the uterine secretion. A blow sometimes operates as the exciting cause.

The treatment consists in applying to the part the extract of belladonna; opium mixed with ceratum cetacei; the extractum conii or fresh hemlock in a poultice; a plaster of soap serate; a piece of hare-skin, or oiled silk. When the pain is very urgent, and the breast unusually full, leeches are useful. The internal medicines are directed to the restoration of the proper state of the uterine secretion; and those preferred by Sir A. Cooper, are calomel and opium joined with mild aperients; the mistura myrrhæ cum ferro; the ferrum ammoniatum; rhubarb and soda with columba; and conium joined with rhubarb. *

2. Sir Astley Cooper also gives an account of what he calls *simple chronic tumour of the breast;* a case resembling the indolent form of pancreatic sarcoma, described by Mr. Abernethy. It occurs in young patients of healthy appearance; grows very slowly, is at first superficial, extremely moveable, has the feel of a conglomerate tumour, and does not affect the absorbent glands. It cannot be cured without an operation; but it is quite free from malignancy. †

3. After acute inflammation of the breast, a deep-seated, uneven hardness often remains, which, when irritated by any accidental cause, becomes painful, of a livid red colour, and so like an occult cancer as frequently to be mistaken for it. These are the kinds of

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* Lectures, vol. ii. p. 216.

† Vol. cit. p. 211.

cancer, which are alleged to have been cured by bleeding, the repeated application of leeches, emollient and narcotic applications, low regimen, &c. One of the principal characters by which the previous cases may be detected, is, that they are all of them more or less painful on being handled; while a true scirrhus is not so, not even at the period when the lancinating pain has begun in it, provided it be uncomplicated with an attack of inflammation.*

4. The *hydatid tumour of the breast*, described by Sir A. Cooper, and so named from its containing cysts of the nature of hydatids, is at first unattended with pain, and is not so hard, nor so distinctly circumscribed as scirrhus. The skin over the part is not discoloured, and the health is unaffected, even when the swelling has attained a great size. In time, a part of it presents a manifest fluctuation. The tumour is pendulous, and the whole breast very moveable, though the disease may be bulky. The case is painful, only when the cysts are inflamed. The absorbents are never diseased. When a cyst ulcerates, or is opened, serum blended with mucus, or a little matter is discharged; and the aperture then heals; but the tumour returns. This form of disease occurs at all ages after twenty; but more frequently in old subjects. It appears to correspond to the *cystic sarcoma* described by Mr. Abernethy, except that it is not at all malignant, and never returns after removal, which is the only mode of cure. However, when the cyst is single, a puncture, and exciting the adhesive inflammation so as to obliterate the cavity, will sometimes produce a cure.†

5. The breasts are subject to swellings of a scrofulous nature, which at first bear a resemblance to indolent scirrhi, and afterwards to ulcerated cancer. They are said particularly to occur between the age of puberty and the thirty-sixth year, and in women, who, though not evidently scrofulous, have thick lips, broad flat noses, &c. M. Bayle has often seen them cured by tonics, the extract of conium, the alkalies, and other antiscrofulous medicines, after the disease had continued more than a year. When the swelling was painful, emollient poultices were applied, and sometimes camphorated liniment. The tincture of iodine internally, and ung. hydriodatis potassæ externally, might here also be tried with advantage. The ulcers, originating from these swellings, sometimes present thickened everted edges; their circumference is of a lead-coloured, or reddish hue; the veins seem dilated, and fungous granulations are produced. In short, they are the strongest likenesses of ulcerated cancer. The age and constitution of the patient; an attentive enquiry into the nature of the pain, discharge, &c., will throw some light upon the diagnosis, and all other doubts will soon be dispelled by the good effects of anti-scrofulous remedies.

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* Dict. des Sciences Med. t. iii. p. 558.

† See Sir A. Cooper's Lectures, vol. ii. p. 163, &c.

6. Swellings often form in the breast, very soon after delivery, in consequence of a milk abscess, or inflammation: but though hard and firm, are commonly nothing more than chronic inflammations, arising in individuals, whose constitutions are somewhat influenced by the state of the secretion of milk. They may generally be successfully treated by exhibiting the compound decoction of sarsaparilla, and employing resolvent remedies.

The following medicines have been most recommended in cases of cancer.

1. Hemlock, or conium maculatum, was highly praised by Storck.* Two grains of the extract were given at night and in the morning, and the doses were sometimes gradually increased to as much as a dram and a half or two drams in the day. The very circumstance of all Storck's cases being represented as cures, might alone have raised suspicions as to the accuracy of his accounts, had not his high reputation operated as a pledge of the truth of his assertions. Subsequent experience has proved, however, that he erred, as a great many other eminent men have done, in consequence of his having confounded with cancer, diseases of another nature. He saw cases get well, which he *supposed* to be cancerous, and he ascribed every thing to the medicine. De Haen declares, that out of 120 cancerous patients, who tried conium, not a single one was cured; and of eight women with cancers of the uterus, to whom he administered hemlock on Storck's plan, not one obtained a recovery. Fothergill, Akenside, and Kirkland in England; and Bierken, in Sweden, reaped no better success from the exhibition of conium. Most of these writers, however, acknowledge its usefulness in resolving scrofulous, and some other indurations. Such was also the opinion of Cullen. † Lastly, Dr. Alibert, tried Storck's plan on more than 100 women afflicted with ulcers of the uterus, and other cancerous diseases, without finding the least benefit result from it.‡ Whether conium ever renders the progress of these cases slower and less painful, is a point, on which different opinions are entertained.

Small doses of the extract of belladonna have been found sometimes to lessen the pain of cancerous diseases §; but all idea of its being capable of curing them is universally renounced. The same report may be made respecting aconitum, the aqua laurocerasi, and stramonium. ||

3. Acetite of copper is the principal ingredient in the remède de

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* Libellus de Cicuta, Vindob. 1760.

† Materia Med. part ii. chap. 6.

‡ Dict. des Sciences Med. t. iii. p. 662. Nouv. Elém. de Therap. t. i. p. 425. Nosologie Naturelle, &c. t. i. p. 558.

§ Sir A. Cooper's Lectures, vol. ii. p. 193.

|| ℞. Ext. Stramonii, gr. $\frac{1}{2}$. Camph. gr. ij. M. ft. pil. bis terve die sumenda. The formula directed by Sir A. Cooper.

Gerbet, and Gerbier's pills, two famous nostrums in France, for cancerous swellings and ulcers. Impartial investigation have proved, however, that it produces no good effects in such cases; but, that some instances of noli me tangere (lupus) got well while the patients were taking it.

4. Arsenic was proposed as a certain cure for cancers, by M. Lefebure de St. Ildefond.* His preparation was white arsenic, or acid of arsenic, of which four grains were dissolved in a pint of distilled water. Of this solution, the patient took at first every morning one table-spoonful, in an equal quantity of milk, sweetened with syrup. At the end of a week, if no unpleasant effects arose, a second dose was given every evening, and, after a fortnight, three doses were taken every 24 hours. When the first bottle had been exhausted, another was prepared with six grains of the arsenic, and the third bottle, which was the strongest ever used, contained eight grains. The ulcer was also bathed, and washed with a liquid composed of eight grains of arsenic, in a pint of distilled water, and afterwards covered with a poultice made of carrots, which had been boiled in a similar solution, to which the acetite of lead, laudanum, and the extractum conii were added in various proportions. This author assures us, that he had by these means cured thirty confirmed cancers, in the course of fifty years' experience. Justamond's reports were also highly favourable to arsenic, as a remedy for cancer. † On the other hand, Acrel in Sweden, Metzer in Prussia, B. Bell in Scotland, Pearson in England ‡, and Desgranges, of Lyons, found arsenic inadequate to the cure of cancer, while its deleterious effects in many instances made its discontinuance necessary. No reliance is now put on it, as a remedy for really cancerous diseases, though the testimonies in favour of its good effects in lupus, and other inveterate ulcerations of the skin and lips, are strong and respectable.§

5. Preparations of iron have been recommended by Mr. Carmichael of Dublin.|| He employed the carbonate, the oxyphosphate, and suboxyphosphate of this metal, in doses of from 30 to 60 grains in the day, aloes being given to obviate costiveness. He also used the carbonate as a topical application. Five cancerous ulcers of the face are reported to have been thus cured. It would have been more satisfactory, had these cases not been reputed cancers of the face, diseases which are in reality generally, if not always, very different from specimens of the true scirrhous, or carcinomatous structure. We know that many of these affections are only instances of lupus, or noli me tangere, and that, in their worst

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* Remède éprouvé pour guérir radicalement le Cancer, &c. 8vo. 1775.

† An Account of the Methods pursued in the Treatment of Cancerous and Scirrhous Disorders, &c. 8vo. Lond. 1780.

‡ Principles of Surgery, p. 277. edit. 2.

§ See Klein's Chirurgische Bemerkungen, p. 264.

|| Essays on the Effects of Carbonate and other Preparations of Iron upon Cancer, 2d edit. Dublin, 1809.

forms, they will often yield to the external and internal use of arsenic, conium, stramonium, and other alterative plans, such as the compound decoction of sarsaparilla, with Plummer's pills, &c.

6. Preparations of mercury have been so often tried and found ineffectual and even hurtful *, that little need be said about them. Mercurial frictions, we well know, are amongst the best means for dispersing most indolent swellings, which admit of resolution. They also produce a change in the system, which, like any other alterative, will frequently make obstinate and troublesome sores heal. These effects are the foundation of the notion, that some really cancerous affections have been cured by mercury.

7. Muriate of barytes was proposed by Dr. Crawford; of his three cases, however, only one is allowed to have been cancerous: it was a cancer of the penis, which, notwithstanding some temporary appearance of improvement from the medicine, ultimately proved fatal. The other cases are considered by MM. Bayle and Cayol to have been in reality scrofulous. Pinel and Alibert also confirm the inefficacy of the muriate of barytes in cancer.†

8. Repeated bleeding has been highly recommended, as a means of curing cancer, in particular, by Valsalva ‡ and Fearon. § The latter applied leeches every two or three days, unless the bites caused too much irritation, and he used also the cold lotion of the acetite of lead. In cancerous affections of the uterus, and internal organs, he practised venesection, and, he assures us, that repeated bleedings always have the effect of lessening the pain in the latter stages of disease, when opium and hemlock give no relief. Of the utility of general and topical bleeding, when true cancerous diseases are complicated with common acute or chronic inflammation, no doubt can be ascertained; but experience will not warrant the conclusion, that they have the power of curing either a true scirrhus or cancer. All the alleged cures have in truth been cases of another nature. According to an experienced surgeon, tumours arising from cold yield most readily to the repeated use of leeches, while those which are more indolent, and connected with a languid constitution, give way to hemlock or mercury. ||

9. Living altogether on milk, or on a regimen just sufficient to support life, as first proposed by Pouteau ¶, has been found to retard the malady. A strict vegetable diet, the avoidance of fermented liquors, and the use of nothing but distilled water in every

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* Pearson's Principles, p. 277. edit. 2.

† Dict. des Sciences Med. t. iii. p. 665.; Nouv. Elém. de Therap. t. i. p. 498. Nosologie Naturelle, p. 558.

‡ De Sed. et Causis, Morb. Epist. 39. art. 35.

§ Treatise on Cancers, with an Account of a New and Successful Method of Operating, &c. 8vo. Lond. 1786. This novelty consisted in the plan of bringing the sides of the wound together, and healing it by the first intention. The principles which Alanson applied to amputation, Fearon extended to operations for cancer.

|| Sir E. Home on Cancer, p. 154.

¶ Œuvres Posthumes, tom. i.

thing which is taken as drink, have also been recommended.* But although some favourable reports have been made of the effects of such treatment, its power of completing a cure is not much credited, and, I observe, that Sir A. Cooper in his lectures is by no means an advocate for it.

10. With respect to opium, its utility is limited to alleviating the pain and misery of cancerous diseases, and procuring rest.

11. Various mineral waters, blisters, and issues † are mentioned by writers; but all idea of their power to cure cancerous diseases is now universally renounced.

I next proceed to the consideration of topical remedies.

1. Arsenic put on cancerous ulcers act as a caustic, and destroys the parts. In a few days, all the ulcerated surface is converted into an eschar, on the separation of which the remaining sore sometimes heals. But, in other examples, the application brings on dangerous symptoms, colic, shivering, vomiting, syncope, &c. and even death. Fernel tells us of a woman who had a cancer of her breast, to which a mixture of arsenic and corrosive sublimate (oxymuriate of mercury) was applied: she died in six days, with symptoms indicating that she had been poisoned. With a view of preventing such disasters, arsenic has therefore been generally mixed with other less deleterious ingredients, such as dragon's-blood, cinnabar, &c. These compositions are moistened, and made into arsenical pastes. Modern surgeons seldom venture to apply arsenic to true carcinomatous ulcers, because its irritation is sure to do infinite harm, unless the whole of the diseased parts admit of being destroyed by it, which rarely happens. If the parts are to be extirpated, the knife is the surest, safest, quickest, and least painful means. If, however, arsenic is not to be advised as a topical application for true cancers, it deserves trial in cases of lupus or noli me tangere, and other reputed cancerous ulcerations of the skin, lips, and other parts of the face.

2. Caustic potassa, the nitrous and sulphuric acids, the nitrate of silver, even the actual cautery itself, can only cure cancer on the principle of a complete destruction of the diseased parts; a plan which is always uncertain of accomplishment, and if not completed, must dangerously aggravate the disease. I have seen several patients die in the course of four or five days, in consequence of the violent indisposition brought on by the application of caustics to cancerous and other anomalous diseases.

3. The liquor plumbi acetatis alone, or mixed with laudanum, spirit of wine, and camphor, is a common application. The late Mr. Ramsden often used it for indolent swellings of the breast; but, the cases which I saw successfully treated by him in this way,

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* See Lambe's Reports on the Effects of a peculiar Regimen on Scirrhous Tumours, &c. Abernethy's Surgical Works, vol. ii. Classification of Tumours, p. 93.

‡ Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 275.

were certainly not real scirrhi. Sir E. Home adds his testimony, however, in confirmation of the application sometimes actually dispersing tumours which resemble scirrhi. * The employment of the diluted liq. plumbi acetatis, and leeches, by Mr. Fearon, has been already noticed.

4. Opium, cicuta, belladonna, and other narcotics, have been extensively tried as topical applications, in the form of plasters or laudanum, to scirrhi; and of laudanum, lotions, fomentations, and poultices to ulcers. With the exception of laudanum for sores, these narcotics are, perhaps, nearly as safe as any dressings which can be used, because they are not likely to create irritation.

5. The carrot poultice is one of the safest dressings for cancerous sores, and has long been in frequent use in England. However, the idea of its being able to cure such diseases, is not retained by any honest or judicious surgeon.

6. Preparations of irons have been praised as topical applications; viz. a solution of the sulphate of iron, ℥j to ℔j of water, or covering the surface of the sore with a paste made of arseniate, or carbonate of iron † moistened with water. It is far from being proved, however, that these applications have answered, except for phagedenic ulcers, cases of lupus, &c.

7. Amongst a great variety of topical remedies which have been suggested, but not found effectual, I shall only mention the following: the fresh bruised plant of the house-leek; the juice of the berries of the phytolacca americana, or the extract; a mixture of ℥ss of the juice of digitalis in ℔j of water; the gastric juice of animals; fermenting poultices; olive oil; various discutient plasters; electricity.

8. The long-continued application of cold running spring water. ‡

9. Whatever doubts may be entertained about the prudence of venturing to try several of the local remedies to which I have adverted, all surgeons now seem to agree about the propriety of retaining a scirrhus in an equal temperature, and as much as possible defended from accidental violence. With these views, it is usual to advise patients to keep the swelling covered with a piece of swan's-down, or rabbit's-skin, soap plaster, oiled silk, or belladonna plaster.

10. Methodical pressure was a few years ago strongly recommended. The only essential part of this plan is the compression of the cancerous tumour, gently at first, and with a force gradually increased, till at last it is augmented to a very great degree. If the cancer be open, the cavities are filled up with finely levigated chalk, and all the surface thickly covered with hair-powder,

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* On Cancer, p. 154.

† Carmichael, Essay on the Effects of the Carbonate and other Preparations of Iron on Cancer, &c. 8vo. Dublin, 1809. edit. 2.

‡ Alibert, Nosologie Naturelle, &c. t. i. p. 561.

over which long straps of plaster are put, so as to cover the whole surface of the tumour. Compresses are then laid on, and the whole firmly bound down with a long roller; or over the first straps are laid a second set, bracing the parts more firmly than the first; next a plate of lead; and lastly a roller carried round the chest. With respect to the merits of the plan, it appears from investigations made at the Middlesex Hospital, that the specific action of cancer is not subdued by pressure, and that it accelerates the coming on of the last fatal symptoms. "It frequently gave so much pain, that the patients could not, after repeated trials, endure it, under any modification whatever; and often it appeared to hasten the fatal event." We learn, "that in the scirrhous tumours, the disease advanced, rendering extirpation necessary in two instances; in six others, the disease passed into ulceration, assuming the usual malignant appearances, and terminating in death." *

In truly carcinomatous affections, the removal of the whole of the diseased parts with a knife, when they admit of being thus entirely cut away, is the measure by which the patient is sometimes fortunate enough to be permanently relieved. Many delicate and difficult considerations occur, however, in this part of practice. In most cases, the whole of a cancerous breast can be completely removed; the operation is neither difficult nor dangerous in itself; the wound resembles any other simple wound; and it generally heals up very well. But, unfortunately, in a certain proportion of cases, the disease, sooner or later, recurs in the same or some other part of the body, and, as some writers urge, generally in a much more violent form than before the operation.

But it cannot be doubted that some writers, who have been led by this fact to reprobate the operation altogether, have carried their mistrust in the resources of surgery too far; and De Houppeville himself, who condemns the operation, seems to have succeeded by this means in curing four women who were afflicted with occult or ulcerated cancers; and many similar cures are upon record, in some of which the patients remained perfectly free from the disease, at periods exceeding twenty and thirty years after the operation.† If, however, we suppose (as I think we are bound to do,) that amongst these and other histories of the same nature, some of the tumours extirpated were not really cancerous, we cannot reasonably extend this opinion to the whole of the cases in question; and the number to be regarded as true scirrhi, is still large enough to show the impropriety of an absolute rejection of the operation.

The accuracy of the three following propositions seems unques-

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* Surgical Obs. by C. Bell, vol. i. p. 4—11.

† Vacher, Diss. sur le Cancer des Mamelles, p. 119—174, 12mo. Besançon, 1740; Mém. de l' Acad. Royale de Chirurgie, t. iii. p. 25—40; Sabatier Médecine Operatoire, t. ii. p. 335. edit. 1. Unzer, Gazette Salutaire, Mars, 1791. Hill's Cases in Surgery, 8vo. Edinb. 1772.

tionable. 1. After the extirpation of a scirrhous tumour, whether the disease be indolent or painful, or small or recent, there is no certainty that the disease will not recur. 2. Neither is it certain that the disease will return, even when it has made considerable progress. 3. The more recent the disease is, the less the chances are of relapse.

As soon, therefore, as a tumour is considered to be a real scirrhus, the earlier the operation is performed the better. We know of no other plan which holds out as good a prospect of relief, and though not exempt from the possibility of failure, it frequently succeeds. It is also declared by high authority, that when the patients undergo an alterative course of medicine, as soon as they have recovered from the operation, relapses are less frequent, than in former days. *

When, however, the patient has several cancerous affections, a case which is unusual, or is of very advanced age, which generally renders the disease indolent, the knife should not be employed, the operation should not be done.

When the extent and situation of the disease are such as to render the removal of the whole of the morbid parts impracticable, the operation, of course, must not be attempted. The partial extirpation of a true scirrhus, whether by caustic or the knife, is sure to convert the distemper into a malignant ulcerated cancer, and hasten the patient's death. Hence, in no operation is the aim at quickness more dangerous, and the the maxim of "*sat cito, si sat bene*" should never be out of the surgeon's mind. Above all things, a free removal of the skin, covering and adjoining a scirrhus, and of the surrounding fat, is highly advisable.

Sometimes, however, notwithstanding all possible precautions to cut away every particle of the disease, the wound, instead of healing up, changes into a cancerous ulcer. Every prudent surgeon, therefore, should ensure his own reputation by making a guarded prognosis.

When the axillary glands are diseased, the surgeon is to remove them, as soon as he has taken away the scirrhus of the breast. A fact, however, to which I have already adverted, merits attention; viz. cases have occurred, in which the axillary glands, though very much enlarged and indurated, were not in a scirrhous state; but merely inflamed from irritation.† In such examples, Louis, Desault‡, Klein, Assalini, and § Soemmering have successfully extirpated cancerous breasts, without removing the axillary glands. As, however, it is scarcely possible to know beforehand, whether the glands are simply inflamed, or truly cancerous, we should undoubtedly make it an invariable rule to take away all such as are swelled and hardened. After the removal of a cluster of diseased glands from the axilla, a swelling of the arm has been known to ensue, and cause the patient's death.* According to Sir A. Cooper, if several glands in the axilla be enlarged, their removal will not prevent the return of the disease, because there are others beyond the reach of the knife.†

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* Sir A. Cooper's Lectures, vol. ii. p. 198.

† Vacher, op. cit. p. 154—171.; Zinn, in Comment. Societ. Gotting. t. i.

‡ Chir. Bemerkungen.

§ De Morb. Vasorum Absorbentium.

Camper believed, that a sure sign of the incurability of a cancerous breast, consisted in a shooting pain between the second and third ribs, at the place where the mammary vessels quit the cavity of the chest. He was persuaded, that, when such pains commenced, the cancerous distemper had extended to the lymphatic glands underneath the sternum, which have a communication with both breasts by means of absorbent vessels, and, therefore, he deemed the operation too late. In opening women who had had a breast removed, and some of whom lived till the wound was quite healed, Camper found the glands under the sternum changed into cancerous excrescences, which had already made their way through the intercostal muscles, and formed a projection beneath the integuments. No man would be justified, I think, in imitating Richerand, who ventured in one case even to cut away a part of the ribs and pleura costalis itself. The poor patient was trebly remarkable: first, on account of the extraordinary ravages of the disease; secondly, because his case was an instance of a cancerous breast in a male subject; and, thirdly, because he was himself a surgeon, capable of judging of the dangerous nature of the operation to be done upon him. Richerand, in his haste to communicate the history of this formidable excision to the Royal Institute of France, was rather too sanguine in his description of the success which was likely to follow the proceeding; for hardly a month more had elapsed, when tidings arrived of the patient's decease.

In ulcerated cancers, the chances of a cure are less than in cases of scirrhus. However, when the patient is not too far reduced, and the whole of the diseased parts can be taken away, the operation will sometimes answer. Some high authorities may be cited in justification of the operation, even when there is little or no reason to expect the avoidance of a relapse. Thus, Monro says, when an ulcerated cancer is reducing the patient so rapidly that he is likely to be carried off in a very short time by it, we should operate as the only means of prolonging the patient's days.‡ And Mr. Abernethy remarks, that the ulceration and self-destroying process of cancer are so horrible, that it may be stated, as an argument for the operation, that a patient gets rid of a quantity of disease upon easier terms by having it removed by the knife, than by suffering it to proceed in its natural course. When the scar or surface of the wound, after the operation, becomes indurated and cancerous, the patient suffers much less pain, and there is much less fetor in the disease thus formed, so that the patient's sufferings are on the whole much diminished*; a remark which perfectly coincides with the experience of a judicious foreign practitioner.†

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* Sir E. Home on Cancer, p. 62.

† Lectures, vol. ii. p. 200.

‡ Edinb. Med. Essays, vol. v. art. 32.

Nothing can be a stronger proof of the propriety of operating even upon many ulcerated cancers, than the unexpected radical cures which have been frequently known to follow operations, undertaken merely with the view of lessening the patient's sufferings, and extending life for a short period. Thus, Le Cat operated and cured an enormous ulcer, which had rendered one rib carious, and destroyed several of the axillary glands.‡ Foubert successfully removed both breasts; one of which was scirrhous; the other, deeply ulcerated.§

Another question is, whether we ought to operate more than once upon cases in which a relapse unfortunately happens, supposing the form of the tumour, and its relation to the adjacent parts, should not constitute an impediment to the practice? A relapse is itself undoubtedly one of the most valid arguments against operating, because as the disease has already returned, and we are ignorant of its causes, it may return again. Should the relapse happen, however, in the situation which it previously occupied, the case is not so discouraging as when it attacks other parts; because, in the first instance, the return of the complaint may possibly be owing to some undiscovered portion of the disease being left behind; while, in the second, no doubt is left about a constitutional tendency to the distemper.

Sabatier repeated operations for cancer, in two remarkable instances: a woman underwent one operation, which was very severe, owing to the largeness of the tumour. She enjoyed good health for ten years, but having then a relapse, she was operated upon again, and continued well at the end of five more years. The same surgeon operated three times upon an officer's breast, whose health was afterwards very || good. M. Lacombe operated four different times upon a woman's breast, who, at the end of five years after the last extirpation, was enjoying perfect health.¶

With the view of preventing relapses, Mr. Abernethy strongly urges the propriety of endeavouring, after the operation, to quiet the nervous system, and keep the digestive organs in as healthy a state as possible; and he recommends a mere vegetable diet, with as much milk, broth, and eggs, as is just sufficient to hinder the patient from losing strength.**

Other surgeons, like Klein, Flajani, &c. have confidence in issues,

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* Abernethy on Tumours, in Surgical Works, vol. ii. p. 186.

† Klein, Chirurgische Bemerkungen, p. 261. 12mo. Stuttgart, 1801.

‡ Journ. de Méd. 1761, t. iv. p. 258.

§ Mém. de l'Acad. de Chir. t. iii. p. 25.

|| Sabatier, Méd. Opertoire, t. ii. p. 335.

¶ Propositions sur le Cancer, Paris, 1805.

** Abernethy on Tumours, p. 93, in Surgical Works, vol. ii.

which they recommend to be kept open a long time.[*] Abroad an idea also prevails, that relapses are less frequent, when the wound is not healed by the first intention, but allowed to suppurate.[†] As, however, this was the old practice in England, and it had not attractions enough to preserve its ground amongst us, I see no reason for restoring a method certainly attended with numerous disadvantages. Sir A. Cooper recommends a course of alterative medicines.

CHAP. XXVII.

FUNGUS HÆMATODES,

We are indebted to Mr. John Burns[‡], of Glasgow, for the first distinct account of this formidable disease which he called *spongoid inflammation;* and the additional particulars of the subject, subsequently published by Hey, Freer, Wardrop, Langstaff, and others, have afforded a good deal of information respecting the history of the distemper, which is usually regarded as of the same nature as the *medullary sarcoma*, described by Mr. Abernethy. It commences with a small colourless tumour, which is soft, when not covered by an aponeurosis, but firm when situated beneath it. When the disease occupies merely the adipose, or cellular membrane, upon the surface of the muscles, the tumour is not usually painful in its beginning; nor does it impede the motion of the muscles on which it is seated. But when deeply seated in the limbs, it causes pain and weakness of the part affected. Also, when it occurs in the mamma, its growth is attended with considerable pain.[§]

For a considerable time, the tumour is smooth and even, but afterwards projects irregularly at one or more points, and here the skin becomes thinner, and of a livid red colour. The swelling has a considerable degree of elasticity, yielding to pressure, and rising up again immediately this is taken off.

The sensation of a fluctuation often seems to be so manifest, that the mistaken surgeon plunges a lancet into the tumour, with the intention of discharging the fluid supposed to be present.[||] An error of this kind is generally a serious one, as a painful bleeding fungus, which rapidly acquires a very large size, shoots out of the opening, and by the irritation and loss of blood which it occasions, soon destroys the patient. But in the natural course of the disease, openings are at length formed in the projecting parts of the swelling, and a thin bloody matter is discharged. Almost immediately after the formation of these apertures, a small fungus protrudes, which rapidly increases both in breadth and height, and frequently bleeds profusely. The discharge is thin, and exceedingly fetid. The integuments round the ulceration are red and tender. The neighbouring glands swell, and assume the spongy morbid structure of the original tumour. If the patient still survives, similar tumours frequently make their appearance in other situations, and hectical symptoms, and repeated hemorrhages, put a period to life.

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[*] Chir. Bemerkungen, p. 264. Collezione d'Osservazioni, &c. di Chirurgia, t. i. p. 207, &c.

[†] Flajani, Op. cit. t. i. p. 278.

[‡] Dissertations on Inflammation, vol. ii.

[§] Hey's Pract. Obs. in Surgery p. 290, 291. edit. 2.

[||] See Wardrop on Fungus Hæmatodes, p. 126. M'Kechnie's Case of Fungus Hæmatodes, in Edinb. Med. and Surg. Journal, vol. vii. p. 168. Earle in Med. Chir. Trans. vol. iii. p. 60.

On examining the affected parts after death, or amputation, the tumour itself is found to consist of a soft substance, somewhat like the brain; membranous partitions intersect it, and there are cells, or abscesses, in various places. The tumour frequently dives between the muscles down to the bones, and is not invariably contained in an entire cyst. The adjoining muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver than muscles. The bones near the tumour are always carious. The disease sometimes appears to be brought on by external violence; but frequently the cause is quite unknown.

Fungus hæmatodes has now been observed in numerous situations and organs, viz. the eye-ball, the superior and inferior extremities, the testicle, liver, spleen, kidney, lungs, uterus, ovarium, mamma, thyroid gland, neck, and fauces.

No remedy seems to have the least power in checking this formidable disease; all escharotics, even undiluted oil of vitriol, are incapable of destroying the fungous growths as fast as they are regenerated. Nothing seems to offer a prospect of preserving life, except the early and total removal of the disease with a knife; and, of course, this is not always practicable, on account of the situation of the tumour. When it can be done, no part of the surface surrounding the tumour should be left, as the disease would certainly recur.

Here, however, it is incumbent on me to state the melancholy truth, that, excepting an instance or two where the eye-ball appears to have been removed with the promise of lasting success *, almost every attempt to extirpate the disease by simply cutting away the morbid part has failed, the fungus re-appearing with increased malignity. The only cures with which I am acquainted, are a few which were accomplished by amputation of the limb, and are related by Mr. Hey. But, as the observations of the same gentleman

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* See Hey's Practical Observations, p. 290. edit. 2. Wardrop on Fungus Hæmatodes, p. 8.; and a Case by Wishart, in Edinb. Med. Journ.

prove, even amputation does not always have the desired effect; for, if the distemper has extended itself in the slightest degree to any part of the stump, a relapse appears to be certain.

It is much against the general success of all attempts to extirpate fungus hæmatodes, that the distemper is frequently not confined to one part or organ. Thus, when the disease has appeared on the lower extremity, tumours of the same nature have been observed, after death, situated in the lymphatic glands, along the course of the iliac vessels and abdominal aorta; and when the eye-ball has been the seat of the disease, various little spots or tumours, resembling in structure the medullary, or cream-like consistence of fungus hæmatodes in general, have been observed between the cranium and dura mater, and between the tunica arachnoides and pia mater. On the whole, I am inclined to think with a modern author, that fungus hæmatodes is either originally a constitutional disease, or very soon becomes so.*

Although fungus hæmatodes has generally been confounded with cancer, it is a widely different disorder. Instead of being hard and unyielding, like a scirrhous tumour, it is generally soft and elastic. Instead of being intersected by the same kind of ligamentous fibres or bands, which exist in a scirrhus, fungus hæmatodes consists of a soft pulpy matter, which mixes readily with water, and is hardened by acids, or by being boiled in water. When the skin, or external covering, of fungus hæmatodes gives way, instead of the morbid growth being destroyed by ulceration, as in cancer, a quick-growing fungus arises from it, and the tumour seems to increase with even greater rapidity. This fungus, instead of having a firm texture, like that which sometimes arises from a cancerous ulcer, is a dark red or purple mass, of an irregular shape, and of a soft texture, is easily torn, and bleeds profusely when slightly injured. A primary cancer seems to be confined to few organs and few textures; and while, in some of these, fungus hæmatodes in its primary state has not been seen, it has been detected in other parts, where no true scirrhous structure has ever been met with, as, for instance, the liver, spleen, kidney, and lungs. While cancer also is rather a disease of advanced life; most patients attacked by fungus hæmatodes are young.†

Fungus hæmatodes of the eye, will be described in the second part of this volume.

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* C. Bell, Surg. Obs. vol. i. p. 410.

† See Wardrop on Fungus Hæmatodes, chap. xii.

CHAP. XXVIII.

OF SYPHILIS; OR, THE VENEREAL DISEASE.

The venereal disease is generally believed to arise from a specific, morbid poison, which, when applied to the human body, produces effects, either on the part to which it is immediately applied, or on various parts of the system, in consequence of absorption.

The effects, produced on the part, to which the poison is directly applied, are called *primary symptoms;* while those happening in consequence of the virus being absorbed into the circulation, are termed *secondary.*

When the primary symptom is a sore, it is denominated a *chancre;* and when the absorbed matter, in its course towards the circulation, makes the absorbent vessels or glands inflame and suppurate, the latter complaint is named a *bubo*, which likewise generally ranks as a primary symptom, because the virus, which produces it, is only on its way into the circulation, and the swelling is not in reality an effect of the poison, after its arrival in the sanguiferous system.

According to several authors, amongst whom is Mr. Hunter, the primary symptom may also be a discharge of *venereal matter* from the urethra, or from the surface of the nymphæ, clitoris, meatus urinarius, &c. in women, well known by the name of a *clap* or *gonorrhœa.*

The earliest or first order of *secondary symptoms* generally consists of ulcers in the throat or skin, or of spots on the surface of the body. The second order comprehends either swellings of the bones, periosteum, and tendons, called *nodes*, or else mere pains in these parts.

In the opinion of Mr. Hunter, gonorrhœa and chancre arise from the application of the same specific virus. The difference of the effect he explains by the application being made, in the first instance, to a secreting surface; and, in the second, to one that does not secrete; but, this belief in the identity of the infections, which produce these very different diseases, may now be said to be rapidly declining.

According to Mr. Hunter, the application of venereal matter commonly gives rise to inflammation, followed by a discharge from secreting surfaces, and by ulceration in other parts. It is acknowledged, however, that inflammation is not invariably produced by it.

Although the matter of *primary* venereal complaints, viz. of chancre, bubo, and, according to Hunter, of gonorrhœa also, contains the venereal poison, and can communicate the disease to others, the matter of all *secondary* venereal complaints does not contain the specific virus, nor, of course, possess the property of being able to impart the distemper to others. Neither is the blood, nor any of the secretions, of a venereal patient, possessed of such quality.

After the venereal virus has been conveyed into the circulation by the absorbents, Mr. Hunter inferred, that it did not long continue there, but was soon ejected, together with some of the excretions. Previous to its expulsion, however, it contaminates certain parts of the body, and gives them a *disposition* to the disease. Mr. Hunter's chief reason for supposing, that the virus does not remain long in the circulation, is that, when the parts, first affected with secondary symptoms, have been cured, before the disease is eradicated from such parts, as are generally affected with secondary symptoms at a later period, the first parts which have been cured, never again become diseased *from the same stock of infection*, as, in all probability, they would do, if the virus continued mixed with the circulating fluids.

The reasons why the virus, after being absorbed, is sometimes expelled again, without leaving, in any parts whatsoever, a disposition to the disease, or in other words, any contamination, are not very well solved by the Hunterian theories. Neither do they explain to us, why the number of parts, to which the disposition is communicated, by the absorption of the virus into the system, should vary so considerably, as we find happens in different examples. Mr. Hunter, indeed, assigns to mercury the power of *preventing* the formation of the disposition; but, then, he represents the presence of the virus in the constitution as being so transient, and the disposition to the disease as being produced so nearly about the same time in whatever parts are contaminated, that, in a multitude of cases, the supposition, that mercury has been given to *prevent* the disposition in all or some parts, is altogether inconsistent with the foregoing principles.

But, though Mr. Hunter believed, that the *disposition* was formed nearly about the same time in such parts as happen to be contaminated; yet, his doctrines teach us, that they fall into a state of palpable disease, or (to use his own language) they afterwards take on the diseased *action* at different periods, some showing much sooner, than others, the local effects of the disease. This remarkable circumstance in the history of syphilis, Mr. Hunter ascribes, partly to the different susceptibility of action in different organs, and partly to the effect of external circumstances, having no relation to the poison or the constitution.

Of these external circumstances, one of the principal is cold, which accelerates the local effects caused by the passage of the virus through the system. The change from *disposition* to *action* appears also to be hastened by proximity to the surface of the body, and by any great disturbance in the habit from scrofula, gout, rheumatism, and, more especially, fever.

It was likewise one of Mr. Hunter's tenets, that the change from disposition to action, never happened while the constitution was under mercurial irritation.

He inculcates, that, when the disposition has taken place, the action may be suspended by mercury; but the disposition will remain, and the action show itself at some period after the mercurial irritation has ceased. But, although mercury cannot destroy a disposition already formed, it may hinder the disposition from being formed at all, or, in other words, prevent contamination. When the action has begun in one order of parts, it may be cured, and will not return in the part, or that order of parts, from the same stock of infection. But the diseased action may take place in another order of parts, if that other order has been contaminated; and, in this order, it must be treated as in the former. When the diseased action has taken place, and been cured in the part first affected, in the throat and fauces, the skin and the bones, or periosteum, the patient may be regarded as free from the disease.

The usual time of the skin, or throat, taking on the diseased action, is, on a medium, six weeks after the subsidence of the mercurial irritation, by which the first symptoms were cured, and in the bones, about twice that time; but, these intervals, between the primary and secondary symptoms, are subject to much variety.

Whatever doubtful appearances may arise in the skin, throat, or bones, during the mercurial irritation under which chancres or buboes are giving way, they are not regarded by Mr. Hunter as venereal; and even if such secondary symptoms occur, after the mercurial irritation has ceased, but earlier than the usual periods above specified, they are not to be considered as unequivocally syphilitic. If no secondary symptoms appear in three months after the mercurial irritation has ceased, and the constitution has not, in the mean time, been occupied by any other disease, we have, for the most part, no reason to apprehend any complaints in the skin or throat from that stock of * infection.

That there are some glaring inconsistences in Mr. Hunter's precepts, with regard to the venereal disease, I think no man of candour will deny. One of the most striking incongruities is the theory, that mercury cannot cure the disposition, and yet, by way of security, the recommendation of its continuance, for a certain time, after all palpable symptoms have been cured.

Throughout Mr. Hunter's writings, we are taught, that it is the invariable character of all really venereal complaints to become progressively worse, and never undergo any amendment, unless mercury, the specific remedy, be exhibited. Thus, chancres on the penis, and ulcers in the throat, are described as constantly growing worse, without the aid of mercury. In the third edition of this publication, which was printed in 1813, I expressed doubts concerning the veracity of this doctrine. I remarked, that, if a

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* See Hunter's Treatise on the Venereal Disease, and Adams on Morbid Poisons, edit. 2. p. 159, 160.

sore put on a healing appearance, without the aid of mercury, we were directed to infer, that the complaint was not venereal. I noticed the advice, which was formerly very common, in doubtful cases, to defer the employment of mercury, for the purpose of judging of the nature of the disease by the foregoing criterion. I then commented on the fact, that primary venereal symptoms will *sometimes* yield to several medicines besides mercury? I called the reader's attention to the mass of evidence in favour of the nitrous and muriatic acids, the oxymuriate of potassa, &c. being in a certain degree anti-venereal. I did not assert, that these remedies could be depended upon as much as mercury; but only that they possessed considerable power over syphilis, and would sometimes make chancres, venereal ulcers in the throat, &c. give way. By reference to the writings of Mr. Pearson, I showed his clear admission, that guaiacum and sarsaparilla were capable of alleviating symptoms derived from the venereal virus, though not of eradicating the disease.* Also his statement, that even bark would sometimes have a salutary effect on incipient buboes, ulcers of the tonsils, and gangrenous sores, from a venereal cause, was particularly remarked, as well as his description of the almost complete reduction of venereal buboes by this † medicine. I called the attention of the profession to Mr. Pearson's observation, that the carbonate of ammonia would sometimes relieve pains of the limbs, and *remove a venereal eruption.* ‡ I adverted to his confession, that he had given the muriate of barytes, with great advantage, when he could not determine possitively whether the case was venereal or not. § I was struck with his remark, that elixir of vitriol would sometimes stop the progress of venereal ulcers, and make venereal eruptions fade and almost disappear, though he represented the benefit as not permanent. I pointed out his evidence, in confirmation of the fact, that the nitric and vitriolic acids had removed both the primary and secondary symptoms of syphilis; and, in some instances, without the former having recurred, or the latter appeared at the usual time, when the cure was imperfect. The declaration of Mr. Pearson and several of his friends, however, that they had never seen a permanent cure accomplished by these acids, where secondary symptoms were present, was not omitted; nor his own decided opinion, that the efficacy of such remedies in curing primary symptoms, was not sufficiently frequent to make them eligible medicines. ||

I concluded, that if so many remedies are alledged to possess a certain anti-venereal quality, we must receive with doubt a doc-

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* Observations on the Effects of various Articles in the Cure of Lues Venerea, edit. 2. p. 12—25.

† Lib. cit. p. 61.

‡ P. 91.

§ P. 106.

|| Obs. on the Effects of various Articles in the Cure of Lues Venerea, edit. 2. p. 236, 237.

trine, that all venereal affections constantly become progressively worse, and never undergo the least amendment, nor put on a healing appearance, without the aid of mercury. I remarked, that if an incipient venereal bubo could sometimes be reduced by bark, as Mr. Pearson affirmed; or if guaiacum, sarsaparilla, mezereon, walnuts, and opium, had often removed some of the primary and secondary symptoms of lues venerea, as the same gentleman confessed; we were justified in suspecting, that *it is by no means the invariable character of syphilitic complaints to proceed, in every instance, from bad to worse, even though no medicines at all be exhibited.* I added, that whether this suspicion were correct or not, the inference to be drawn from Mr. Pearson's observations, at all events, appeared to be, that venereal sores, &c. would often become better, and even heal without mercury.

Since the period when the foregoing reflections were made, the great question, whether syphilis is curable without mercury, has been completely settled, chiefly by the meritorious labours of the surgeons of the British army.

The results of their experiments and enquiries furnish the most unequivocal proof, not only that syphilis may be cured without mercury, but even without the aid of any medicines whatsoever. As far as I can judge, no other inference ought ever to have been drawn from all the evidence which may be brought to bear upon this point, from a review of circumstances connected with the history of the venereal disease; and this, whether we adopt the vulgar opinion, that true syphilis has only been known in Europe subsequently to the year 1493, or the belief, to which I am myself inclined, that it is a disorder which has prevailed from the earliest antiquity. In order to avoid, however, as much as possible, the latter controverted point, we shall confine ourselves to periods in which the existence of syphilis in Europe has been generally acknowledged.* A great many practitioners, both in the sixteenth and seventeenth centuries, combated the venereal disease with considerable success, without the aid of mercury. Fallopius, Palmarius, Abercromby †, and several others, who might be cited, furnish proofs of the fact; their principal remedies having been guaiacum, sarsaparilla, and antimonials, with occasional venesection, and purging.

Had it been the invariable character of the venereal disease to become regularly worse without mercury, no patients could ever have recovered, before the use of that mineral, in the treatment of the distemper, had been introduced into Europe *; a supposition, contradicted by abundant evidence. Nor is it here necessary to avail ourselves of the arguments, which might be deduced from the cessation of the ravages of the particular distemper which broke out in the French army at the siege of Naples in 1494; because I do not see how we are authorized by the descriptions extant to regard that disorder in any other point of view, than as a contagious malignant fever, or pestilence, spreading with such celerity as to destroy a large army; an event totally irreconcilable with the well-established facts, that true syphilitic complaints are for the most part chronic, the primary sores only communicable by contact, and the secondary not in any way infectious. Better evidence on the point before us seems to me to be furnished by a review of the practice of the old surgeons, to whom I have already adverted; for, as they cured venereal complaints without mercury, at periods when syphilis unquestionably prevailed, it never can be argued, that *none* of their cases, so treated with success, could have been of that nature; a conjecture, which, though it must naturally arise out of the Hunterian theories, appears, in the present state of our knowledge, to be erroneous.

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* There is so much difficulty in reconciling many of the phenomena and old theories respecting the venereal disease, that I am not at all surprised to find its very existence disputed in a modern anonymous publication; "*Sur la Non-existence de la Maladie Vénerienne,*" Paris, 1811.

† The work of this author, which was obligingly pointed out to me by Mr. Dunn, of Scarborough, is remarkable on account of its title: "Tuta ac Efficax Luis Venereæ sæpe absque Mercurio, ac semper absque salivatione mercuriali Curandæ Methodus;" Authore Davide Abercromby, M.D. 12mo. Londini, 1684.

An opinion is sometimes entertained, that the venereal disease is modified by climate, and that it can be cured in warm countries, by means which would completely fail in colder parts of the world. The facility of curing the venereal disease in the West Indies, the Brazils, &c. with sarsaparilla, guaiacum, and other vegetable productions, is a fact, which has long been familiarly known. Without the acknowledgement of such efficacy in these remedies, or in the powers of the constitution, the advocates for the American origin of syphilis, and the believers in the incurability of the disorder without mercury, would be totally unable to explain how it happened, that the population of the new continent was not annihilated by syphilitic ravages long before the visit of Columbus. In Portugal, the use of mercury, in the treatment of the venereal disease, is nearly abandoned; the disorder proving there very mild, and being curable for the most part by mere topical treatment, or wearing itself out without the use of any adequate mercurial remedy. During a superintendance of the Portuguese hospitals for upwards of two years, Dr. Fergusson observed, that the common practice of the surgeons of that country was to cure all cases by simple topical applications; and the return of the patients to hospital with secondary symptoms, after being thus treated, was far from being an universal, or even a frequent occurrence.[*] It is curious to learn, however, with respect to the British soldiers in Portugal, that the disease in them was often peculiarly severe, a circumstance ascribed either to the difference of their constitutions from those of the natives, or to the treatment pursued by our surgeons being less beneficial, than what was adopted by the Portuguese. This striking diversity in the progress and consequences of the disorder cannot, I think, be rationally imputed to any modification of the virus itself by climate, but rather to a modification of the constitution by that cause, habits of life, &c.; because, if we adopt the first of these opinions, viz. that the thing is to be explained by a change of the virus itself, why should the disease, when contracted from the same sources of infection, have been followed only by mild effects in the Portuguese, and by a severe train of consequences in the British? But, should I be mistaken in supposing, that the constitutions of the natives rendered them less susceptible, than our troops were, of the ill-effects of the disease, then I see no other mode of accounting for the difference, than by concluding, that the simple treatment, followed in the Portuguese hospitals, was attended with more benefit, than the long and injudicious courses of mercury, which, in conformity to the then existing doctrines, were probably adopted in our own establishments, with little discrimination between real syphilis, and other resembling complaints, to which I shall presently advert.

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* In China, where the venereal disease is said to have existed 2000 years, mercury has been employed for its cure from time immemorial. See the reports of Toureau, and other Jesuits, as detailed in Astruc's work.

Nor is it only in the warmer parts of Europe and America, that syphilis is readily subdued without mercury: the same truth is proclaimed in Asia, as may be learned by referring to Dr. Scott's observations on the anti-venereal virtues of the nitro-muriatic acid[†], and of baths impregnated with it. To me this gentleman's statements appear more important in relation to the point before us, than as connected with the question of the real efficacy of the particular mode of treatment, which it is the object of his essay to recommend; because, as syphilitic diseases are now known to be capable of a spontaneous cure, it becomes doubtful, what share of benefit ought to be ascribed to the acid, especially to its external use in the form of baths.

The curability of every kind of ulcer, by common means, is well known at Paris, where Cullerier annually demonstrates this fact to his pupils; but, after the ulcers are healed, each patient is put upon a mercurial course, in order to prevent secondary symptoms.[‡] Several of the German surgeons, who were in our service during the late war, were always extremely reluctant to prescribe mercury for the cure both of syphilis and resembling complaints; and yet the success, obtained in their hospitals without mercury, was at least equal to what resulted from the opposite treatment in those of other corps.[§]

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[*] See Med.-Chir. Trans. vol. iv.

[†] Ibid. vol. viii. p. 173, &c.

[‡] Guthrie in Med.-Chir. Trans. vol. viii. p. 552.

[§] This seems at first contradictory to the general admission, that mercury, But no facts have had greater weight, than those of Mr. Rose*, in regulating the judgment of modern surgeons, on the question of the curability of syphilis without mercury. The importance of this question (says he) is obvious, not so much in reference to the treatment of syphilis under common circumstances; for, the strikingly good effects of mercury will probably not render it advisable in general to give up the use of that remedy, but from the change which it will produce in our views of the diagnosis of that disease. The distinction, which has engaged such a share of attention of late years, and which is evidently so important between syphilis and syphiloid diseases, has been made to depend so much upon the former admitting of no cure, except by mercury, that, if this principle should be found to be erroneous, the difficulties which have attended it, will, in a great measure, be explained. Mr. Rose then adverts to the occasional trials which have been made of sarsaparilla, carbonate of ammonia, opium, and different acids, in the treatment of the venereal disease, and to the success of some of these remedies, as attested by men of veracity and ample experience. He notices the fact, of mercury either not being used at all in several parts of Europe, or being used in a manner which we should consider totally inadequate to the cure of the disease. He allows, that many of the cases which happened in Portugal, as mentioned by Dr. Fergusson, would not be regarded by cautious practitioners as truly syphilitic, because, in describing the effects of the disease on the British soldiers, this gentleman states, that, *while the constitution was strongly under the influence of mercury*, the patients became affected with secondary symptoms, in a proportion that could not have been expected. Mr. Rose then speaks of the conclusion, drawn by Mr. Carmichael from Dr. Fergusson's description, viz. that the disease, which prevailed in Portugal, was a phagedenic, or sloughing ulcer, different from the true syphilitic chancre, and for which mercury is neither necessary nor serviceable; an inference he considers refuted by the impossibility of supposing, that a country, then over-run by every description of foreigners, could escape the introduction of syphilis. He had tried the non-mercurial treatment in the hospital of the Coldstream Regiment of Guards, for a year and three-quarters, and *had certainly succeeded, without mercury, in curing all the ulcers on the parts of generation, which he had met with in that period, with the constitutional symptoms to which they gave rise.* Though some of these cases might not have been truly syphilitic, it is impossible to suppose that others were not so. A considerable number of them presented the commonly received characters of a

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though not absolutely necessary, often expedites the cure of true syphilitic diseases. In order to reconcile these statements, we should recollect, that mercury frequently retards the cure of other complaints, not truly syphilitic, which are more frequent than the former, in a proportion beyond computation.

* See Observations on the Treatment of Syphilis, with an Account of several Cases of that Disease, in which a Cure was effected without the use of Mercury: in Med.-Chir. Trans. vol. viii. p. 549, &c.

primary venereal sore, as loss of substance, indisposition to granulate, and an indurated margin and base. They were also seen and considered as well-marked cases of true chancre by Mr. Brodie, Mr. Bacot, Mr. Worrell, &c. The battalion of the Coldstream, in which they occurred, consisted of upwards of a thousand men, who, being stationed in this metropolis, and often associating with the lower orders of prostitutes, were particularly exposed to the risk of infection, and might have been expected, in a much shorter period, to furnish many examples of the venereal disease.

In the treatment, all ideas of specific remedies were entirely laid aside. The patients were usually confined to their beds, and such local applications employed, as the appearances of the sores seemed to indicate. Aperient medicines, antimony, bark, sulphuric acid, and occasionally sarsaparilla, were administered. The observations of Mr. Guthrie, Professor Thomson, Dr. Hennen, and indeed the united reports of all our army-surgeons, from different parts of these kingdoms, and France, also fully proved the curability of the primary and secondary effects of syphilis without mercury, and, generally speaking, of all sores, whether truly syphilitic, or only of a resembling nature, "provided sufficient time be granted, the constitution be good, the patient regular in his mode of living, and attention be paid to cleanliness and simple dressings, and to keep the patient in a state of quietude." *

From the preceding facts and view of the subject, many curious and important considerations naturally arise. In the first place, they oblige us to renounce all the most important doctrines advanced by Mr. Hunter, and adopted in almost every school, in relation to the history, progress, and cure of the venereal disease. They compel us to believe, either that true syphilis has totally changed, in the course of the last twenty or thirty years, or that most of the Hunterian theories about it were always false, and founded upon mistaken notions. At the present day, it will be extremely difficult to come to a positive decision, with regard either to the altered nature, or diminished frequency of syphilis; more especially, when we recollect two facts; first, that ever since the epoch of the supposed introduction of this disease from America, there have always been practitioners, who successfully treated every form of venereal complaints without mercury; and secondly, the absolute impossibility of our asserting, that if experiments had been formerly made, similar to those which have now been undertaken on a public spirited, impartial, and extensive scale, the same results and inferences would not have followed. The facts, recently established, lead also to other highly interesting questions, concerning the frequency and nature of the secondary symptoms, which occur when no mercury has been employed.

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* Guthrie, Med.-Chir Trans. vol. viii. p. 556.

Upon an average, according to Mr. Rose, one out of every three of the sores, thus treated, was followed by some form or other of constitutional affection, which was in most instances mild, and sometimes so slight, that it would have escaped notice, if it had not been carefully sought for. The constitutional symptoms were evidently not such as could be regarded as venereal, if we give credit to the commonly received ideas on the subject. Caries of the bones, and some of the least equivocal symptoms, did not occur. In no instance was there that uniform progress, with unrelenting fury, from one order of symptoms and parts affected to another, which used to be considered as an essential characteristic of true syphilis.[*]

Great diversity, however, prevails in the statements, relative to the frequency of secondary symptoms where no mercury has been used. While Mr. Rose represents the proportion, observed by himself, to be as great as one out of every three cases, only six cases of secondary symptoms were remarked in the York Hospital, in nearly 100 patients, who had been treated without mercury. It is allowed, however, that the real proportion might have been somewhat larger; and, according to some other returns, collected by Mr. Guthrie, the proportion would appear to be about one-tenth.[†] It is mentioned by Dr. Hennen, that eruptions were much more common in patients treated without mercury, than in others treated with it; but the breakings out did not end in ulcerations, as they frequently did when that mineral had been used.[‡] The observations, drawn from the returns of certain military hospitals, and published by Mr. Guthrie, also tend to prove, that mercury lessens the frequency of secondary symptoms; for it appears, that out of 521 cases, treated with mercury in one district, only ten cases of secondary symptoms happened.[§]

As to the general mildness and curability, without mercury, of these secondary symptoms which take place in cases where that mineral has not been employed, the reports of nearly all the gentlemen, who have entered into this investigation, completely agree. They also concur about the rarity of an affection of the bones.

The further the subject before us is investigated, the more reason we find to join Hunter, Carmichael[‖], and others, in the belief, that what has been generally considered as syphilis, is not one disease, but several, and that "*other diseases* may not only resemble the venereal in appearance, but in the mode of contamination; proving themselves to be poisons, by affecting the parts of contact; and from thence producing, not only immediate consequences similar to buboes, but remote consequences, similar to the lues venerea."

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[*] See Med.-Chir. Trans. vol. viii. p. 422.

[†] Ibid. p. 559—561.

[‡] Edinb. Med. and Surg. Journ. No. 54. p. 202.

[§] Op. et. vol. citat. p. 569.

[‖] See his inquiry into the probability of the spontaneous origin of some diseases, which bear a resemblance to the constitutional symptoms of Syphilis, in his "Essay on the Venereal Diseases, which have been confounded with Syphilis." 4to. Lond. 1814.

If any gentleman is entitled to superior praise for industry and talent in the investigation of the distinctions, between syphilis and the diseases generally confounded with it, this high compliment, I think, is unquestionably due to Mr. Carmichael. He confines the term syphilis to that disease, in which the chancre, or primary ulcer on the genitals, has a *hardened edge and base;* in which the blotches are *scaly*, as described by Willan, with the *excavated ulcer of the tonsils*, noticed by Hunter; or, when affections of the bones are complained of, those patients alone are truly syphilitic, who have *nocturnal pains in the shafts of the long bones*, or *decided nodes*, or *enlargement of the bone.* All other cases, though many of their characters may resemble those of syphilis, are not to be considered as syphilitic; but, as they proceed from sexual intercourse, he adopts the term venereal for them. * In considering the primary and secondary symptoms of the disease, I shall notice some of the principal opinions advanced by Mr. Carmichael, to which the greatest attention is certainly due. One of the most important propositions, to which his observations lead, is, " the constant association of a distinct and peculiar train of constitutional ailments, with corresponding primary symptoms, demonstrating that the regularity, which marks the character of all morbid poisons, also has a place in venereal diseases."

OF TRUE CHANCRES, AND OTHER PRIMARY SORES.

Chancres signify sores which result from the application of true syphilitic matter to a part of the body; and, consequently, they are generally situated on the genitals. A true chancre, according to Mr. Hunter, is somewhat of a circular form, excavated, without granulations, with matter adhering to the surface, and with a thickened edge and base. This hardness, or thickening, is very circumscribed; not diffusing itself gradually and imperceptibly into the surrounding parts, but terminating rather abruptly. When the disease occurs on the prepuce, or frænum, the effects of the inflammation are more extensive. When the sore is on the glans penis, it sometimes causes profuse bleeding. In women, chancres are usually situated on the labia, or nymphæ, and, very rarely, in the vagina. The discharge from a chancre contains the true syphilitic poison, and, of course, is capable of imparting the disease by contact or inoculation.

Mr. Carmichael also adopts Mr. Hunter's definition of chancre, and points out, that it is the solidity, firmness, and abrupt termination of the surrounding induration, which chiefly distinguish it from other ulcers. The induration, he says, is less marked, when a chancre is situated on the body of the penis, but then the sore is of a dark livid colour, which, if mercury be not resorted to, "is alternated every third or fourth day, with that of a light brown, or tawny, sufficiently distinguishing it from the dark sloughing ulcer, with which it might be confounded." The chancrous ulcer, at the same time, extends its dimensions slowly, and, "as it advances, the surrounding induration obviously increases." Phymosis and inflammation are also "less frequently attendants upon chancre, than upon those ulcers which are destitute of its characteristic marks." The secondary symptoms, represented by Mr. Carmichael, as following the absorption of the virus of a true syphilitic chancre, or bubo, are, first, an eruption of scaly blotches, presenting either the character of lepra, or psoriasis, unattended with any obvious degree of fever; secondly, excavated ulcers of the tonsils; thirdly, pains in the joints, tibiæ, cranium, &c.; fourthly, nodes. He proposes also for venereal diseases, a new nomenclature, founded on the characters of the eruptions, which he thinks afford the most certain criterion, and he names the true chancre and its consequences the *scaly venereal disease.*[*]

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* See an Essay on the Venereal Diseases, which have been confounded with Syphilis. 4to. Lond. 1814.

Mr. Carmichael divides the primary diseases which have been confounded with syphilis, into two classes; the first comprehends, 1. A superficial ulcer, without induration, but with elevated edges. 2. A similar ulcer, destitute not only of induration, but of elevated edges. 3. An excoriation of the glans penis, and internal surface of the prepuce. 4. Gonorrhœa virulenta. From the first of these four diseases, he has been seldom able to trace any constitutional symptoms. The constitutional symptoms of the other three he describes as precisely alike.

In the second class, Mr. Carmichael comprises the two remaining species of pseudo-syphilitic disorders, viz. the phagedenic ulcer, and the sloughing ulcer. In the year 1814, he calculated, that the number of patients with these ulcers, who sought admission into the hospital under his charge, exceeded those with true syphilitic chancre in the proportion of five to one. What the proportion may be at the present time I know not; but it must be wonderfully changed, if the very curious assertion, subsequently made by this author, be correct, viz. that, in the considerable space of time which had elapsed since he published his first essay, *he had met with only three cases of true syphilitic chancre in all his extensive practice, public and private.*[*] How we are to reconcile this account with Dr. Hennen's statement, that, on an average, twenty out of every 105 are Hunterian chancres, is difficult to say, unless we suppose the latter gentleman is more easy in admitting cases as chancres than Mr. Carmichael, who rejects all ulcers from this class, which do not possess "the callous edge and base, terminating abruptly under the skin, and feeling nearly as hard as a piece of cartilage."

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[*] See Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, p. 202, &c. 8vo. Dublin, 1818. Also, Essay on Venereal Diseases, edit. 2. p. 304, &c. 8vo. Lond. 1825.

[†] Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, p. 14.

Let us now consider more particularly the primary diseases, which Mr. Carmichael has described as being liable to be confounded with syphilis, excluding from present attention, however, the subject of gonorrhea. The first class of these diseases are: —

1. *The superficial ulcer, without induration, but with elevated edges,* presents a reddish brown surface. It is not excavated, but is either on a level with the surrounding skin, or considerably raised above it, though sometimes the elevated edges give an appearance of excavation. At its commencement, it appears in the form of a small pustule, attended with itching. It sometimes bears a strong resemblance to the phagedenic ulcer, from which, however, it may be distinguished by its raised and well-defined margin, the absence of the irregular and corroded surface, and of the pain of that ulcer. It may be known from a chancre, by having no callous edge and base. It occurs on the external surface of the prepuce, body of the penis, and scrotum; and sometimes a circle of small ulcers of this kind forms upon the orifice of the prepuce, producing an obstinate phymosis, which remains after the sores are healed, and requires the use of the knife. Mr. Carmichael has seldom traced this sore to its constitutional symptoms, but, in the appendix to his essay, he details two cases, in both of which the eruption was *pustular*, and afterwards spread into ulcers, covered at first with *thin* crusts. In short, the ulcer with elevated edges, without induration, according to Mr. Carmichael, is liable to be followed by buboes with undermined edges; an eruption of pustules, generally phlyzaceous, preceded by fever, and terminating in ulcers covered with thin crusts, healing from their margins, and, when the disease is on the wane, the eruption desquamates into scaly red blotches. On the fauces, ulcers occur in different places, with a white aphthous appearance; and sometimes pains in the joints and nodes. To this ulcer, and its consequences, Mr. Carmichael applies the name of *Pustular Venereal Disease*, from the character of the eruption.*

2. *The simple ulcer, without induration, elevated edges,* or *phagedæna*, has neither the indurated base, which attends the true syphilitic chancre, nor the elevated edges which surround the primary ulcer of the pustular venereal disease; nor the surface of the primary phagedenic ulcer. It begins on the prepuce, or body of the penis, as a small pustule; then forms a thin crust, which soon falls off, leaving an excavated, round, or oval sore. In the second week, this fills up, and afterwards rises above the skin, presenting a smooth surface, of a healthy colour, but without granulations, and with somewhat of a fungous appearance. It most frequently occurs on the glans and internal surface of the prepuce, when it ge-

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* Op. cit. &c., p. 62.; Lond. Med. Journ. for 1815; and Essay on Ven. Diseases, edit. 2. p. 148. 8vo. Lond. 1825.

nerally excites phymosis; but is sometimes on the outside of the prepuce, on the body of the penis, or on the scrotum; and, in women, it takes place on the labia, perineum, and fossa of the nates.

3. *Excoriation of the glans penis, and internal surface of the prepuce, attended with purulent discharge,* is usually accompanied with gonorrhœa, and produces phymosis. The corona glandis is the part most affected; but, when the prepuce can be retracted, the excoriation is found to be in patches only, with intervening spots of sound cuticle.

Mr. Carmichael's observations lead him to believe, that the constitutional symptoms, which are apt to follow the small ulcer without induration, or elevated edges, and the patches, excoriation of the glans and prepuce, and, even in some rare examples gonorrhœa virulenta, are the same, and therefore, that all these diseases have their source in the same venereal poison. The constitutional symptoms consist of more or less fever, which ushers in a *papular* eruption, and soreness of the fauces, attended with difficulty of swallowing, severe pains in the head and larger joints, iritis, and sometimes inflammatory swellings over the superficial bones, which many would call nodes.* The whole of these cases, taken collectively, he names the *Papular Venereal Disease.* †

The second class of primary diseases, which have been confounded with syphilis, consists of two species; viz. the *phagedenic ulcer,* and the *sloughing ulcer.*

1. *The phagedenic ulcer* is described by Mr. Carmichael, as a corroding sore, without granulations, or surrounding induration, spreading with great rapidity, and having its destructive process increased, instead of being checked, like chancre, by mercury. It more frequently attacks the glans, which it sometimes totally destroys, and occasionally, notwithstanding "every anodyne and lenient application, the ulceration will gradually proceed, until the entire penis is destroyed." The ulceration, by destroying the coats of an artery, may produce such profuse hemorrhages as can only be stopped by ligatures, but, in this case, its progress is arrested. One of its remarkable characteristics is the frequent return of ulceration, after the part has healed, to the very same spot which was first affected. The constitutional symptoms are, an eruption of tubercles, or spots of a *pustular* tendency, or both intermixed, preceded by fever, and terminating in ulcers covered with thick crusts, which often assume a conical form, healing from their centre, and extending with a phagedenic margin.‡ The affection of the throat is "a white slimy-looking ulceration, which occupies almost the whole of

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* Essay, &c. p. 82. See his Obs. on the Symptoms and Specific Distinctions of Ven. Diseases, p. 205., and his Essay, &c. edit. 2. 1825.

† Carmichael's Obs. on the Symptoms and Specific Distinctions of Ven. Diseases, p. 209.

‡ Ibid.

the back of the pharynx in view; and may be followed by caries, exfoliation of the spongy bones, tenderness of the ossa nasi, and a foul discharge from the nostrils. The velum and uvula are occasionally destroyed, so that on looking into the mouth of a person in this lamentable state, there appears one vast continuous ulcerated cavity, covered with white viscid matter, and extending from the palate to the lower part of the pharynx. At the same time that the patient is thus affected, the larger joints, and sometimes the smaller, also become red, swelled, and exquisitely painful, and nodes suddenly appear, which cannot be distinguished by their aspect from those of syphilis. According to Mr. Carmichael, the ulcer with elevated edges not unfrequently exhibits the apparently corroded surface, which characterises the phagedenic ulcer, and its secondary symptoms also have a very close resemblance to those of the latter sore. *

2. *The sloughing ulcer* at first resembles a small black spot, which produces so little uneasiness, that it remains unnoticed for several days; it soon, however, increases, and, when the slough separates, the sore is not clean and granulating, as after simple mortification, but a corroding phagedenic ulcer appears, which becomes painful, assumes a bluish cast, and is soon covered again with a fresh slough. It proceeds in this manner, alternately sloughing and ulcerating, until the whole of the external organs of generation, and sometimes the bladder also are involved, and, even if the progress of the disease be checked, the orifice of the urethra is so contracted, that great difficulty in voiding the urine is experienced. The sloughing ulcer is said to produce the same kind of secondary symptoms as are connected with the phagedenic sore, and the whole of these affections Mr. Carmichael distinguishes by the name of the *Phagedenic Venereal Disease.*

Such is the arrangement proposed by Mr. Carmichael, in which, however, many surgeons do not coincide; I mean with respect to the regularity and peculiarities of the secondary symptoms, and of the eruption in particular, represented by that gentleman as appertaining to each primary † disease. Indeed, he carries this doctrine so far as to say, that, with the exception of some anomalous cases presently to be noticed, every primary affection has its corresponding eruption, so that we may foretell by the former what the latter will be; or, if we have only the opportunity of seeing the eruption, we may judge what the primary ulcer has been. That many difficulties still oppose the complete reception of these doctrines is a truth, which candour obliges me to state. Various observations published by Dr. Hennen and others, prove, that primary sores, of a determinate character, frequently communicate ulcers of a very different description, and sometimes more than one kind of sore to the same infected person. Certain cases, detailed by Mr. Evans, show, that various sores may be the result of a connexion with common prostitutes, in whom no complaint at all can be detected; such ulcers probably arising from the mere irritation of the natural secretions of the parts. There must, also, be some hesitation in the adoption of the sentiment respecting a particular virus having the power of producing a primary phagedenic sore, because this character of an ulcer rarely exists from the commencement, and when it occurs, may frequently be referred to disordered health, bad treatment, neglect, and other circumstances. Also, since a phagedenic sore is generally attended with great pain, its frequency is much greater, than could be accounted for by the supposition of patients in this state being likely to have connexion with women. Mr. Carmichael, however, with his usual candour and devotion to truth, wishes his facts to be considered independently of all theory about the plurality of poisons; and, certainly, the *frequent* association of particular primary complaints with secondary ones of determinate characters, is a point first established by him, and promising a great deal of additional light to this obscure subject.

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* Op. cit. p. 59.

† "As we have seen true syphilis accompanied by eruptions not scaly, so we have seen the primary symptoms of pseudo-syphilis described in the first class of our author's arrangement, followed both by pustular and tubercular eruptions; and that the same infection will also produce eruptions of a different character in different individuals, has been ascertained," &c. See Lond. Med. Repository, vol. iv. p. 323.

With respect to the *treatment of the true syphilitic chancre*, the fact of even this kind of sore being generally capable of cure without mercury, though often in a less expeditious manner, must be admitted, the proofs of it being most unequivocal. The determination of this point, however, is far from amounting to any thing like a decision, that mercury ought not to be employed in the cure. On the contrary, all those gentlemen who have so ably investigated the point, candidly own, that mercury generally expedites the recovery. Thus, Mr. Guthrie tells us, that ulcers, possessing the true characters of chancre, required in general a longer period than other sores for their cure, "that is, from six, eight, to ten, twenty, and even in one case twenty-six weeks, healing up and ulcerating again on a hardened base;" and he afterwards expresses his conviction, that almost all these protracted cases would have been cured in one half, or even one third, of the time, if a moderate course of mercury had been resorted to, when common applications were found to fail.* If some other statements laid before the public by another gentleman were correct, however, the effect of mercury in accelerating the cure of chancres would be less striking; because it is said, "the general period (required for the healing) was four weeks, and this whether the sores possessed the Hunterian characteristics or not." * It is admitted, however, by the same author, that the cure of some other protracted cases would probably have been hastened by the use of mercury. The fact of the possibility of curing true chancres without mercury is then, by no means, to be confounded with the question of the propriety of the practice. It is of vast importance, however, as it demonstrates the error of inferring, that a sore cannot be venereal because it is healed without mercury, and exposes the equally false and still more dangerous notion, that large quantities of this mineral are necessary for the cure of a chancre. It teaches us, that, in unfavourable states of the health, we may await its improvement with safety, before we have recourse to the medicine. In short, it instructs us, that mercury, though useful, is not so absolutely necessary in the treatment, as to claim the name of a specific for any primary syphilitic ulcers. Hence it ought to be prescribed in moderation, and rather in alterative doses, than in such quantities as are calculated to excite profuse salivation.

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* Med.-Chir. Trans. vol. viii. p. 558, 559.

Whether the united experience of surgeons in general ultimately confirm, or not, Mr. Carmichael's belief in the existence of different venereal poisons, and in the uniformity of the secondary symptoms arising from each of them, still, I think, one truth will remain unshaken; viz. that true syphilitic chancres are often influenced in their progress by constitutional causes. In irritable weak habits, even after the original character and appearance of the sores have been changed by mercury, we often find, that the ulceration will continue to spread, or sloughs to be formed. Too often, under such circumstances, the foul appearance of the ulcerated surface leads the unwary practitioner to increase the quantity of mercury; the system then becomes more and more disordered and debilitated; and the local disease grows worse with the declension of the health, until either the patient dies, or is absolutely too weak to employ the destructive medicine any longer.

To the foregoing statement, Mr. Carmichael himself also assents; admitting, that neglect, local irritation, and excessive constitutional irritability, will cause a venereal ulcer, as they will any other, to become phagedenic, however mild originally in its nature. It must, therefore, he observes, be in the highest degree useful to attend to the progress of an ulcer, and if possible ascertain, *whether it was of the phagedenic species from its commencement*, or not; and, if not, it is not to be classed with that venereal disease, which may be termed phagedenic. †

Whenever chancres, which originally presented the true syphilitic character, afterwards alter, and rapidly extend themselves by a phagedenic, or sloughing process, there is always great reason to believe, that the alteration is owing to an unfavourable state of the constitution, irritation of the diseased part, or general bad treatment. In such cases, mercury should be omitted, without delay; bark, sarsaparilla, guiacum, and the nitrous or sulphuric acid prescribed, with absolute rest, plenty of good fresh air, &c. As far as my observations extend, one of the best dressings in these cases is a solution of the extract opium, in the proportion of ʒiss to ℔j of water, which may be applied by means of lint, laid under a simple pledget. Thus the state of the constitution will be amended; and, as this happens, the morbid appearances of the sore, which depended on general weakness and irritability, will disappear; and then, if necessary (which I believe will rarely be the case,) mercury may be given in moderate quantity again.

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* Hennen, in Edinb. Med. and Surg. Journ. No. 54. p. 207.

† Obs. on the Symptoms, &c. of Ven. Diseases, &c. p. 61. The existence of a primary phagedenic ulcer, originating from a specific poison, independent of constitutional causes, is not universally admitted.

As every surgeon knows, a true syphilitic chancre, while small, may be cured by removal with the knife, or destruction with caustic, and, if none of the virus has been absorbed, the patient will remain free from secondary symptoms. As, however, there is always an uncertainty, whether absorption has taken place or not, the plan has never been very commonly adopted, because if mercury is to be given at all events, with the view of preventing secondary symptoms, no good is gained, as the sore will heal very well without it. Astringent lotions, containing the sulphate of copper, or that of zinc, and any common simple ointment, are the best general applications for chancres. The dressings must vary, however, according to the state of the sore; and, in the healing stage, when the granulations are high, the use of the nitrate of silver, or of the unguentum resinæ with ʒj of the pulv. hydrargyri nitrico-oxydi to each ounce of it, will materially expedite cicatrization.

With regard to the treatment of primary complaints, liable to be confounded with true chancre, my limits oblige me to be very brief.

The superficial ulcer, without induration, but with elevated edges, may be cured by dressing it with washes, either of oxymuriate of mercury and lime-water, in the proportion of a grain to an ounce; or of the submuriate and lime-water, in the proportion of ten grains to an ounce; or of the compound spirit of lavender alone, or diluted with one or two parts of water. Together with these applications, Mr. Carmichael orders decoctions of sarsaparilla, and small doses of antimony, either separately, or in conjunction. "Primary ulcers, with elevated edges (says he), are often extremely obstinate under the use of mercury. I have frequently seen that medicine exhibited in full doses, which maintained a strong mercurial action in the system for several months, without inducing them to heal." He assures us, also, that stimulating and caustic applications do no good, and if the ulcer be irritable make it extend. "In fact, our principal care should be to keep the patient at perfect rest; and this observance, with gentle astringent applications, or mild ointments, seems to be all that is requisite," the above medicines being prescribed rather to satisfy the patient, than as essential.*

The *simple primary ulcer, without either induration or elevated edges*, requires the same treatment as the former case, except when it appears on the external surface of the prepuce, body of the penis, or on the scrotum, resembling a fungus, or soft wart; in which case, the wash should consist of two or three grains of the oxymuriate of mercury to an ounce of water.

The third example "*excoriation of glans penis, and internal surface of the prepuce, attended with purulent discharge*," may also be cured by simple means, resembling those recommended for the two preceding cases. As, however, it is often joined with gonorrhœa and phymosis, the chapters on those subjects may be consulted.

Mr. Carmichael is strongly adverse to the plan of giving mercury in cases of phagedenic chancres, which he represents as being invariably rendered worse and more intractable by that mineral. With respect both to this and the *sloughing sore*, "the treatment which succeeded best, was the use of means calculated to lessen inflammation and pain, including general blood-letting, antimonials, purgatives, cicuta, and opium. The local applications were warm fomentations, and bread poultices, frequently with the addition of opium. In every instance, low diet, and the recumbent position, were strictly enjoined." Mr. Carmichael also found nothing more effectual in stopping the progress of these destructive ulcers, than "the division of any band of integument, which connected two portions of the ulcer together," such division being merely an anticipation of the destruction of this bridle by ulceration. He also commends the removal of any jagged part of the edges of the ulcer, or of the adjoining surface, which may have a livid colour, and be ready to fall into ulceration; measures, which he thinks owe their utility chiefly to the bleeding excited by the use of the knife.†

OF SYPHILITIC AND OTHER BUBOES.

While no venereal matter has been taken up from the surface of a chancre by the absorbent vessels, the disease is entirely local. The matter, in its passage through the inguinal glands, frequently occasions an inflammation and enlargement of them, followed by suppuration and ulceration. The secondary affection is named a venereal bubo. The syphilitic poison (it is also not unfrequently supposed) may sometimes lodge on the sound skin, be absorbed without the occurrence of any ulceration at all, and a bubo be the consequence. However, true syphilitic buboes are commonly preceded by a chancre; and it is a remark made by Mr. Hunter, that they more frequently follow sores on the prepuce, than those on the glans.

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* See Obs. on the Symptoms and specific Distinctions of Ven. Diseases, p. 47.

† Op. cit. p. 64, 65.

The absorbent glands in the groin are subject to enlargements, which are altogether unconnected with venereal causes, and require to be discriminated from true venereal buboes. Mr. Hunter was of opinion, that commonly only one gland is affected by the absorption of true syphilitic matter; and, if this be the case, we have one criterion, by which a true venereal bubo may be known from other swellings. The syphilitic poison also affects the glands nearest the seat of absorption, and never those, which are situated in the course of the iliac vessels, and higher up.

The syphilitic bubo commonly begins with a sense of pain, soon followed by a small hard tumour, which increases, like every other inflammation, that has a tendency to suppurate. If not checked, it advances to suppuration and ulceration, the progress of the matter to the skin being quick.

Some few syphilitic buboes, however, are slow in their progress, and Mr. Hunter suspected, that the inflammatory process is then retarded by mercury, or a scrofulous tendency.

According to Mr. Carmichael, the distinguishing characteristics of a syphilitic bubo, are more difficult to assign, than those of chancre; but, he conceives, that the aching pains, which attend it, the callous feel of its bottom, and its dark, foul, tawny appearance, may assist in forming a diagnosis. I perfectly agree with this valuable writer, respecting the propriety of not ordering mercury for buboes, which have not been preceded by chancres.

Buboes not of a syphilitic nature are generally preceded, and attended with a slight fever, or, as Mr. Hunter says, the common symptoms of a cold, and the swellings are usually indolent and slow in their progress; but when quicker than common, they are more diffused than syphilitic buboes, and often affect at once several glands. In general, they do not suppurate, but continue stationary; and, when they do suppurate, it is slowly, and often in more glands than one. The matter comes slowly to the skin, unattended with much pain, and the integuments are of a dark purple colour. If the swelling be only in one gland, be very slow in its progress, and give but little or no pain, it is probably scrofulous.

The same observations, which have been delivered, respecting the falsity of the doctrine, that true syphilitic chancres do not admit of cure without mercury, are equally applicable to the buboes, which originate from such primary sores. Thus, in a great many of the cases, which were treated in the hospitals of the Guards without mercury, the absorbent glands of the groin were affected, and often suppurated. "The abscesses were in general allowed to burst of themselves, and almost all of them healed readily." Two cases, however, are mentioned, which proved more troublesome; one was that of a sloughing or phagedenic bubo; the other an instance in which the difficulty arose from the number of absorbent glands, which became affected.* In numerous other cases of primary sores, treated without mercury, as referred to by another late writer, we are informed, not only, that buboes occurred on the average with less frequency, than in other instances, where mercury had been used, but also, that these swellings were not so often followed by suppuration; a circumstance ascribed to the antiphlogistic means which were employed. Mr. Hunter, who had the same implicit faith in the necessity of mercury in the cure of syphilitic buboes, which influenced all his opinions relative to the true venereal disease, conceived, that, in attempting to effect the dispersion of a syphilitic bubo, it was an object of high importance always to make as much mercury as possible pass through the swelling, by rubbing the unguent. hydrarg. on surfaces, from which the absorbents tended to the seat of the local disease. The same plan he deemed equally commendable when a bubo of this nature was in a suppurated state; for, both in this and the preceding stage of the swelling, the medicine, says he, thus applied, cannot pass into the common circulation without going through the diseased parts, whose cure it must promote in its passage through them, while it also prevents the matter, which has already passed, and is still continuing to pass, into the constitution, from acting there, so that the bubo is cured, and the constitution preserved.

According to the Hunterian precepts, then, the thigh, leg, or part of the abdomen on the same side as the bubo, are the places on which the frictions should be made. Mercury, however, was never intended to do more, than cure the specific quality of the inflammation. When the common inflammation rises very high, bleeding, purging, and fomentations are requisite auxiliary means; and if the bubo be conjoined with erysipelatous inflammation, Mr. Hunter recommended bark; if with scrofulous, hemlock, and poultices made with sea-water. True syphilitic buboes ought seldom to be opened. When it is thought proper to open them, the skin should be allowed to become as thin as possible; for the abscess will heal better in consequence of this rule being observed. How long the mercurial frictions are to be continued, and in what quantity the ointment is to be rubbed in, are questions to which different replies would be made by the believers in the Hunterian tenets, and by what may be called the mercurial reformers, who, while they generally inculcate the possibility of curing all forms of syphilis without mercury, acknowledge the superior efficacy of this mineral in accelerating the cure of some of them, and rendering secondary symptoms less frequent, which advantages they think may also be best obtained by prescribing mercury in small alterative quantities. While surgeons were swayed by the belief, that no syphilitic disease could be cured without mercury, the common plan, when a bubo healed very slowly, was to discontinue this mineral after the constitution had been kept a certain time (perhaps five or six weeks) strongly under its influence. But when the bubo had rapidly healed, mercury was given for a fortnight or three weeks afterwards. It was universally admitted, however, that there were many instances, in which it was quite unnecessary to continue mercury until a bubo had entirely healed.

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* Rose, in Med.-Chir. Trans. vol. viii. p. 579. Guthrie, Op. ct. vol. cit. p. 558.

Sometimes the sores produced by buboes assume an ill-conditioned appearance, even when they are losing, or are quite deprived of their original syphilitic character. We are not, therefore, always to set down the backwardness of a bubo to heal, as a mark of the presence, or continuance of its first nature. The disorder, produced in the system by a course of mercury, is frequently the cause of syphilitic buboes being gradually converted into phagedenic ulcers, or such as will not cicatrize. In scrofulous constitutions, the irritation of venereal matter, in its passage through an absorbent gland frequently gives rise to a scrofulous enlargement of the groin, and this disease cannot be made to heal by the influence of mercury; on the contrary, if the system should have already suffered much from a mercurial course, perseverance in this treatment will change the usual indolence of a scrofulous abscess, or ulcer, into a foul, fast-spreading, ill-conditioned, local disease. In these cases, bark, sea-bathing, pure air, and the internal and external use of hemlock, are serviceable.

With regard to such buboes as belong to what Mr. Carmichael terms the *papular venereal disease*, and arise from primary ulcers, which he distinguishes by the negative characters of having neither callosity, raised edges, nor phagedenic surface, his experience has not taught him, that mercurial frictions will discuss these swellings. On the contrary, the trials, which he has made of this medicine, incline him to believe, that it tends to increase the inflammation and chance of suppuration; and, that when in a state of suppuration, they will heal better if the patient be not subjected to a strong mercurial irritation. He observes, that buboes of this nature are often remarkably hard and indolent, without any tendency to subside, or suppurate. In such cases, he says, the greatest advantage may be derived from the repeated application of blisters to the indurated bubo, which soon bring about either the dispersion, or the suppuration of the tumour.*

The buboes, which arise from the primary ulcer with elevated edges, are alleged to resemble the original sore in their tendency to form projecting, or undermined edges, particularly, when much mercury is employed; and, says Mr. Carmichael, if these edges are not removed by art, the disease may remain for months, and perhaps years, without healing. He prefers the knife for their removal, as caustic is too slow in its effect; and by this plan he has got many cases well in five or six weeks, which would have resisted any other mode of practice as many months. Full courses of mercury always increase their tendency to *burrow*, and not unfrequently produce dreadful mischief; the integuments even up to the navel being undermined or destroyed. He met with eight or ten ulcers, situated either on the groins, pubes, or scrotum and fossa of the nates, or on all these parts at once in the same individual, and resembling in their raised edges and obstinate nature the primary ulcer of this description. He describes them as creeping on slowly, with margins both raised and undermined; and expresses doubts, whether they should be considered as primary, or secondary ulcers, though he inclines to the former opinion, as they were never accompanied with any other symptoms indicating a general affection of the system. In all the cases, the patients had used large quantities of mercury, and one might therefore regard such ulcers as mercurial, if they were ever observed to arise from the exhibition of mercury for any diseases which were not venereal. Under every mode of treatment, they are obstinate; and, according to Mr. Carmichael, caustic and irritating applications are always injurious. The patient, he says, often recovers under the use of sarsaparilla, country air, and sea-bathing. One very tedious case yielded to Fowler's solution of arsenic, and pressure on the diseased parts with straps spread with equal parts of soap and strengthening plaster. *

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* Observations on the Symptoms and Specific Distinctions of Venereal Diseases, p. 21.

SECONDARY SYMPTOMS.

Mr. Hunter describes the first order of parts which become diseased, in consequence of the diffusion of the virus through the system, as consisting of the skin, tonsils, nose, throat, inside of the mouth, and sometimes the tongue. The second order of parts, or those which are affected in the latter stage of lues venerea, comprehend the periosteum, fasciæ, and bones. This description can only relate to true syphilis, and indeed, of the accuracy of the latter part of the account, doubts must be entertained, if it be established, that nodes hardly ever happen in syphilis, unless mercury be employed.

At first, the skin of every part of the body is generally mottled with discolourations, many of which disappear †; while others continue, and increase. In other examples, distinct blotches occur, which are sometimes not observed till the scurfs are forming. In certain cases, the eruptions come out in the form of small distinct inflammations, containing matter, and resembling pimples; but not so pyramidical, nor so red at the base.

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* Obs. on the Symptoms, &c. of Ven. Diseases, p. 56.

† Though such is the observation of Mr. Hunter, I have known eminent surgeons immediately pronounce an eruption not to be venereal, if any part of it died away, without the interference of mercury.

A copper-coloured, dry, inelastic, cuticle forms. This is thrown off, and a new scurf of the same kind is regenerated. These appearances spread to the breadth of a sixpence; but seldom more extensively, at least for a considerable time. Every succeeding scurf becomes thicker and thicker, till at last it becomes a common scab, and matter forms in the cutis underneath, so that, at last, the blotch becomes a true ulcer, which usually spreads, although slowly.

According to Mr. Carmichael, when absorption of the syphilitic virus into the system takes place, ulceration of the throat is the earliest indication of the general disease; but "the eruption in the skin is usually considered the first of the constitutional symptoms; and this, when truly syphilitic, is scaly, a circumstance, by which it may be distinguished from the eruptions of the pseudo-syphilitic diseases, which are either papular, pustular, or tubercular." * He describes the eruption as always consisting of scaly blotches, presenting either the character of lepra, or that of psoriasis, and unattended with any obvious degree of fever. He represents this as the eruption which follows the absorption of the virus of a true chancre. From a simple primary ulcer, patchy excoriation attended with discharge, or gonorrhœa virulenta, the eruption is papular †, preceded by fever, and ending in disquamation. From the ulcer with elevated edges, without induration, the eruption is of pustules, in general phlyzacious, preceded by fever, and terminating in ulcers, covered with thin crusts, that heal from their margins, and when the disease is on the wane, the eruption desquamates into scaly red blotches; while the eruption, consequent to a primary phagedenic ulcer, consists of tubercles, or spots of a pustular tendency, or both intermixed, preceded by fever, and terminating in ulcers, covered with thick crusts, which often assume a conical form, healing from their centre, and extending with a phagedenic margin. In the decline of the disease, this eruption also desquamates into scaly red blotches. ‡ Very able men, however, dissent from the inference, that no eruption is to be regarded as syphilitic, which is not scaly. They assert, that a primary sore on the genitals, having none of the characters of a true chancre, will produce constitutional symptoms, attended with copper-coloured eruptions, resembling those of syphilis, but curable without mercury; and that while these eruptions are sometimes even scaly §,

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* Essay on the Venereal Diseases, which have been confounded with Syphilis, &c. p. 39.

† In Mr. Rose's investigations, "it appears, that most of the papular eruptions followed ulcers which were not very deep, and which healed without difficulty." However, he could not discover any uniform character in the sores, by which these papular eruptions were preceded. See Med.-Chir. Trans. vol. viii. p. 399.

‡ See Synopsis in Carmichael's Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, &c. 8vo. Dublin, 1818.

§ See Bateman's Hist. of a Tubercular Eruption of Syphilitic Appearance, but curable without mercury in Med.-Chir. Trans. vol. v. p. 225.

true syphilitic eruptions sometimes assume the pustular form.* But, before we pronounce Mr. Carmichael wrong, I think we should follow exactly the line of discrimination which he has recommended; for, in particular stages of the disease, we find, that he himself represents certain eruptions as becoming scaly, which he does not regard as syphilitic. We should consider, as he expressly directs, whether the eruption is scaly from the first, or not; whether it is preceded with fever; whether the affection of the throat differs from what is usually considered syphilitic; and what is the nature of the pains of the limbs? If we compare all these symptoms, as described by Dr. Bateman †, with the criteria of syphilis, particularly insisted on by Mr. Carmichael, we shall immediately perceive, that the latter gentleman would not have hesitated a moment about excluding such cases from the class of true syphilitic eruptions.

VENEREAL SORE THROAT.

In the throat, tonsils, and inside of the mouth, lues venerea generally makes its appearance as an ulcer without much previous swelling. Common inflammation of the tonsils often suppurates in the centre, so as to form an abscess, which bursts by a small opening; but this complaint never looks like an ulcer, which begins on the surface, like the true venereal sore; it is always attended with too much inflammation, pain, and swelling, to be venereal, and immediately the little abscess bursts, the swelling subsides. The complaint is also generally attended with febrile symptoms.

Another disease is an indolent enlargement of the tonsils, which is peculiar to persons disposed to scrofula. Portions of thick mucus, or perhaps coagulating lymph, lie upon the surface of the tonsils, and are frequently mistaken for sloughs or ulcers. When doubts exist, they may be cleared away by removing the thickened mucus with a probe.

An ulcerous excoriation of the tonsils is another disease liable to be mistaken for a venereal ulcer of these parts. This sometimes becomes very broad and foul, having a regular margin; but never extending deeply into the substance of the parts, like the venereal ulcer. If the observations of Mr. Carmichael be correct, excoriation of the fauces is mostly a consequence of the simple primary ulcer, patchy excoriation of the prepuce, or gonorrhœa virulenta, being the cases which he represents as giving origin to the class of symptoms, which he distinguishes by the name of the *papular venereal disease.* When the primary ulcer, with elevated edges, but without induration, is followed by sore throat, Mr. Carmichael finds, that the ulcers affect different parts of the fauces, and are in general of a white aphthous appearance. This is the sore throat, which he describes, as accompanying what he names the *pustular venereal disease.* In the *phagedenic venereal disease* of the same author, the ulcers of the throat also affect different parts of the fauces, and particularly the back of the pharynx, frequently occupying the whole of the fauces, and sometimes extending to the nares and larynx. The affection of the throat is "a white slimy-looking ulceration." The velum and uvula are occasionally destroyed, "so that, in looking into the mouth of a person in this lamentable state, there appears one vast continuous ulcerated cavity, covered with white viscid matter, and extending from the palate to the lower part of the pharynx."

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* See Lond. Med. Repository, vol. iv. p. 516.

† Med.-Chir. Trans. vol. v. p. 226, 227. Mr. Rose has repeatedly seen the scaly blotch in cases where mercury had been freely employed for the primary sores, and where he considered the virus as eradicated, disappear under the use of sarsaparilla. See Med.-Chir. Trans. vol. viii. p. 421.

The true venereal ulcer is represented by Hunter as a fair loss of substance, part being, as it were, dug out of the body of the tonsil. It has a defined edge, and is commonly very foul, having thick white matter adhering to it, like a slough, which cannot be washed away.

This excavated ulcer of the tonsils, however, is not at present universally regarded as a symptom peculiar to syphilis. Mr. Rose has repeatedly seen such a throat cured by sarsaparilla.* Mr. Carmichael, in acknowledging the correctness of Mr. Rose's observation, tells us, that since the publication of the Essay, he has often noticed the excavated ulcer of the tonsils, "either attending the primary phagedenic ulcer, or the train of constitutional symptoms arising from it." †

NODES.

The swellings of the periosteum, tendons, and bones, arising from syphilis, are so called. Their progress is extremely slow, and attended with little pain. In some cases, however, the pain is considerable, particularly in the night-time. They continue a long time before matter forms, and then suppuration is very imperfect.

Sudden swellings of the periosteum, without nocturnal pains, are not venereal. Syphilitic nodes are described by Mr. Carmichael as indolent, slowly-increasing swellings, attended with little pain and inflammation, until in an advanced state. On the contrary, the nodes of diseases, liable to be mistaken for syphilis, seem in the first instance to affect the periosteum and soft parts covering the bone, and not the bone itself, as swelling and redness of the integuments are seen from the very commencement. These swellings arise suddenly, increase with rapidity, and frequently disappear without mercury, as quickly as they arose. In short, they are of a much more inflammatory character, than syphilitic nodes. ‡

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* Med.-Chir. Trans. vol. viii. p. 421.

† Obs. on the Symptoms, &c. of Venereal Diseases, &c. p. 17.

‡ Essay on the Diseases which have been confounded with Syphilis, &c. p. 45.

A very curious fact appears now to be established, viz. that nodes, corresponding to the description of those of syphilis, very rarely occur, except in patients who have used mercury for the cure of other venereal symptoms. The evidence, derived from the late extensive investigations in military hospitals, all tends to the confirmation of this interesting point, of which the explanation is difficult, without supposing that mercury itself has the power of causing nodes; a conjecture refuted by the fact, that except in syphilis, or its resembling diseases, we rarely or never see such an effect on the bones produced by mercury, however long and freely it may have been employed.

The superficial bones are most liable to syphilitic nodes; for instance, the front surface of the tibia, the bones of the cranium, the triangular part of the ulna below the olecranon, &c.

TREATMENT OF SECONDARY SYMPTOMS.

The important fact, of late so unequivocally developed, that both the primary and secondary symptoms of syphilis may generally be cured without the aid of mercury, must of course be followed by an absolute rejection of the claim of that medicine to the character of being the specific for this disease; or the only remedy by which it can be cured. This position I hold to be incontestable, without the other distinct and different questions, concerning the utility of mercury in syphilis, and the propriety of renouncing its exhibition, being at all involved in the statement. That mercury generally expedites the cure, both of the primary and secondary symptoms of syphilis or the scaly venereal disease, is another truth amply confirmed. Yet, we are not to forget, that, in some states of the constitution, even when true syphilitic affections are present, or when ulcers, which were originally of this nature, have assumed the phagedenic, or sloughing form, mercury is of all medicines the most unfit medicine to be prescribed, as instead of promoting the cure, it increases, in a most dangerous manner, both the bad state of the health, and the ravages of the local disease. In making also a due discrimination, between the uses and abuses of mercury, we should ever be mindful of the undisputed facts, that mercury generally benefits not only the ordinary forms of syphilis, but a great many other diseases, both of a somewhat resembling, or totally different description; that a vast number of these disorders, whether cured under the use of mercury, sarsaparilla, guaiacum, antimonials, the mineral acids, the nitro-muriatic baths, sea-bathing, or change of air, would in the end get well of themselves, or by the powers of nature, if the constitution could last long enough; that the efficacy of such means therefore is mostly limited to the abbreviation of these complaints; and that with respect to mercury, or any other potent remedy, if it be not administered in such quantities as dangerously to impair the health, it will not usually hinder any sores, or other complaints from getting well, which are disposed to undergo a spontaneous cure.

We shall admit as the common belief, then, that mercury, though not essential to the cure of all those forms of disease, which are regarded as truly syphilitic, generally abridges their duration, and that on account of this important degree of utility, its exhibition in moderation is right and advantageous.

It may be conveyed into the system, either externally by the skin, or internally by the mouth. In particular constitutions, mercury employed in one way seems to have no effect on the constitution or disease, and then it must be tried in the other. In the same manner, when one preparation of the medicine proves ineffectual, another should be tried, as the change is frequently followed by beneficial effects on the disease.

Sometimes the bowels can hardly bear mercury, and, in this circumstance, it is to be given in the mildest form possible, conjoined with other remedies for diminishing its bad effects on the viscera.

In general, the external employment of mercury is the most advantageous and convenient.

In giving mercury, the first attention should be to the quantity, and its visible effects at a given time; for when those effects have attained a certain pitch they are not to be increased, but only kept up, while the decline of the disease is watched.

The visible effects of mercury are of two kinds; the one on the constitution, the other on parts capable of secretion. In the first, it appears to produce universal irritability, a quick pulse, &c. Salivation, or an extraordinary secretion of saliva, attended with soreness of the gums and mouth, forms the second description of effects. The latter affection is the criterion, by which practitioners have generally calculated the influence which mercury has over the whole constitution; but, from the facts already explained, it is a criterion, which should be no longer adopted, as the cure of syphilitic affections may generally be accomplished without subjecting the patient to all the distress and impairment of health attendant on salivation. But, if it be deemed proper in some cases to resort to this test, the mercury should always be introduced into the system gradually, beginning with small quantities, which may afterwards be increased. At first, one scruple, or half a drachm of mercurial ointment may be rubbed in every night; and if the mouth in a moderate time should not be affected, the quantity must be gradually increased to one drachm or more.

When mercury is given internally, and salivation is aimed at, there are three preparations commonly preferred in syphilitic cases; the pil. hydrarg. which may be given in the dose of gr. x. every night, either with or without opium, as circumstances may indicate; the oxydum rubrum in the dose of gr. i. with or without opium; and lastly, a solution of the oxymuriate of mercury (sublimate). One-sixth of a grain dissolved in brandy, or any aromatic water, or made up into a pill, and given twice a day, is the usual dose. When it is intended, however, only to put the patient on an alterative course, the doses need not be so large, nor frequent; and the submuriate is very commonly preferred.

With respect to the preparation of mercury, in unequivocal cases of syphilis, the most simple are reckoned the best, not only in consequence of their acting with least violence on the system, but also because they prove most efficacious in the cure of the disease. Hence, frictions with the ointment, and the exhibition of the pil. hydrarg. are the most common plans.

It is incumbent on me to mention fumigation, another mode of introducing mercury into the constitution through the skin. It is one of the most ancient forms of administering this medicine, and was much praised in France by M. Lalonette. Mr. Abernethy, who published a description of its advantages, recommends a powder for the purpose, made by agitating the submuriate of mercury in water, mixed with the liquor ammoniæ carbonatis. The patient is placed in a machine, not unlike a sedan-chair, but having an opening at the top, out of which he can conveniently put his head. A heated iron is placed at the bottom of it, and when the powder is thrown on the hot surface of the iron, it sublimes, and is deposited on the surface of the patient's body. The patient afterwards puts on his flannel waistcoat and drawers. No doubt, it would be quite sufficient to fumigate the inside of the clothes, and then let them be put on with care.

Besides mercurial fumigations applied to the whole surface of the body, with the view of affecting the constitution, some practitioners place considerable reliance in the efficacy of topical fumigations with the hydrargyri sulphuretum rubrum for improving the appearance, and inducing a healing disposition in certain primary as well as secondary syphilitic ulcers, which are backward in yielding to the ordinary employment of mercury. In the shops may be procured an apparatus, consisting of a stand, an iron heater on which the mercurial powder is thrown, and a tube for conducting the smoke to the part affected.

With respect to the principle on which mercury acts, the Hunterians suppose, that it cures syphilis, not by any chemical operation, but by exciting, in the constitution and parts affected, a particular action, which overcomes and removes that of syphilitic disease.

At the commencement of this chapter, some of the leading Hunterian principles, on which the treatment of the venereal disease is to be regulated, have been already mentioned. According to Dr. Adams, whenever we have cured a patient of the first local symptoms, we may assure him, that as long as he keeps out of the way of mischief, he is free from all danger of a relapse in those parts which have been cured; but we cannot pretend to inform him, whether the disease will yet appear in his throat, skin, or bones. This uncertainty must remain for a few months, after the chancre or bubo has been cured.* So when the disease has reappeared in the skin or throat, and been cured, we cannot say, whether it will afterwards show itself in the bones, though we know that it will not again do so in the skin or throat. But when the primary complaints, and the secondary in the skin, throat, and bones, have all appeared, and been cured, we may regard the patient as free from the danger of future symptoms from the same stock of infection. As I have already related, the Hunterians explain most of the preceding circumstances, by supposing mercury to have no power of curing the disposition to the disease, but only the action or the palpable and perceptible forms of the distemper; and, by laying it down as a law of this disease, that the same order of parts can never be affected more than once from the same stock of infection.

With respect to syphilitic nodes, mercury is frequently incapable of removing the whole of the swelling: in such cases, blisters applied over the tumour, and kept open with the savin cerate, are highly beneficial.

In the treatment of the constitutional symptoms, described by Mr. Carmichael as proceeding from the simple primary ulcer, patchy excoriation attended with discharge, or gonorrhœa virulenta, this gentleman has recourse to blood-letting when the fever is considerable, the pulse full and strong, and the tongue furred, with severe pains of the joints. He then opens the bowels and the skin by antimonials, and "when the febrile symptoms are reduced," throws in the simple or compound decoctions of sarsaparilla with antimonials, occasionally giving "the mercurial salts in alterative doses," when the disease is completely on the decline. When iritis, hower, is a consequence of these primary affections, he recommends the free use of mercury, until the inflammation is subdued.

When there are phagedenic symptoms, Mr. Carmichael's practice is first to subdue the febrile excitement by blood-letting, daily repeated until the pain and fever have abated; and he prescribes antimonials in nauseating doses, and opium; at the same time applying to the sores warm fomentations, with poultices of bread and water, or bread and a solution of opium; and confining the patient to bed, with the penis supported in the most easy and convenient manner, Cicuta, in large doses, and decoction of sarsaparilla, are afterwards given, "when the primary ulcer is accompanied with constitutional symptoms;" but when there are only constitutional symptoms, he prescribes "the decoction of the woods alone, or conjoined with antimony, or compound powder of ipecacuanha, or muriate of mercury." During the co-existence of the fever and tubercular eruption, or spots of a pustular tendency, Mr. Carmichael is an advocate for blood-letting; and, besides the general means recommended in his Essay, sometimes employs arseniate of kali, nitrous acid, and nitro-muriatic baths. For phagedenic ulcers in the throat, he praises the same general treatment, with the application of oxymel æruginis,a strong solution of muriate of mercury, or nitrate of silver, or fumigations with the sulphuret of mercurcy. Should these remedies fail, " mercury may be used largely with advantage in checking the progress of the ulceration, even though it should exasperate the general disease." This mineral, he observes, increases the ravages of the disease in all its stages but the last. For ulceration and caries, the same plans are also recommended, and the pains in the joints and nodes are to be treated like those resulting from the primary ulcer with elevated edges.*

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* Observations on Morbid Poison, p. 163, 164. edit. 2.; and the Comment. on Hunter's Treatise on the Venereal Disease.

For the secondary symptoms, proceeding from the ulcer with elevated edges, without induration, and characterised by a pustular eruption, Mr. Carmichael advises blood-letting during the febrile state, followed by antimonials, sarsaparilla, guaicum, tar-ointment, baths of sulphurated kali, or nitro-muriatic baths. Mercury, he says, is decidedly pernicious, until the pustules terminate in scaly blotches, instead of forming ulcers; and then mercurials, in alterative doses, conjoined with sarsaparilla and guaiacum, may occasionally be employed with benefit. The same general treatment is recommended for the white aphthous sore throat, often attendant on this form of disease, with common detergent or mercurial gargles; oxymel æruginis, and fumigations of the sores with the sulphuret of mercury. For the pains in the joints, Mr. Carmichael praises the same constitutional treatment, together with leeches, fomentations, bread and water poultices, blisters, and ointment of tartarized antimony. But mercury, he says, should be particularly avoided while inflammation of the knee exists. As for the nodes, resulting from the primary ulcer with elevated edges, he recommends the same general and local means, and sometimes a division of the periosteum. When the preceding means prove insufficient, and the disease is on the decline, he allows that a mercurial course may be of advantage.

The same writer has treated of " anomalous disorders resembling the phagedenic disease, yet not of venereal origin." He adverts to Mr. Abernethy's doctrines, respecting the connection between disorders of the digestive organs and the production of local diseases, admitting, with the latter gentleman, that the surest method of curing these complaints is by improving the digestion and health in general. If, however, there should be an extensive and rapidly spreading ulcer of the throat, he thinks the treatment should be more active, and precisely such as he has recommended for those ulcers of the throat which attend the phagedenic disease, to which he has seen these spontaneous ulcers bear so strong a resemblance that it was impossible for the eye to discover the difference. In most of the instances which he has seen, the eruption also possessed a strong resemblance to the large tubercular eruption, which he describes as

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[*] Obs. on the Symptoms, &c. of Ven. Diseases.

often following the primary phagedenic ulcer; and extending into ulcers, with irregular, jagged, undermined edges, and generally best cured with nitrous acid, or sometimes with small doses of blue pill, or of the muriate of mercury, joined with sarsaparilla. Mr. Carmichael recommends the same general treatment for spontaneous nodes, with leeches and blisters; and if these means fail, he divides the periosteum, which, he says, is usually found much thickened.

CHAP. XXIX.

ANEURISM.

An aneurism is generally a pulsating tumour, arising from a dilated, ruptured, or wounded artery, and filled with blood, which, in the early stage, is in a fluid, and at a later period, in a more or less coagulated state. It originates either from an alteration of structure and consequent dilatation of the several coats of a part of an artery, or from a dilatation of the external tunic alone, the inner coats having previously given way in consequence of disease or violence.* These forms of the complaint constitute the cases which, I think, ought still to be called *true aneurisms*, in which the sac is really a dilated part of the artery itself. When all the coats of an artery are wounded, ruptured, or perforated by ulceration, the tumour is called a *false aneurism*. Here the blood is either extensively injected into the cellular membrane, the case being named accordingly a *diffused false aueurism*; or it is collected in one mass, which is bounded by a kind of cyst, soon formed around it by the adhesive inflammation: this is the *circumscribed false aneurism*.

An aneurismal swelling, which arises directly from a wound or breach, extending through all the coats of the artery, is sometimes known by the appellation of a *primitive false aneurism*; while other cases, which either began with a destruction of the inner coats, and terminated in the giving way of the external coat, or which began with dilatation, and ended in a rupture of all the tunics, are termed *secondary false aneurisms*.†

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* Some writers mention a wound of the outer coats of an artery, and the dilatation of the inner tunic. Arnaud calls this case *hernia arteriæ*. In 1804, Dubois demonstrated to the Ecole de Médecine at Paris, two specimens of the *aneurysma herniosum*, which were found in the thoracic and abdominal aorta of a dead subject, and of course, could not have arisen from any partial wound. It was imagined, that these cases had arisen from the destruction of the external and middle coats by ulceration; and as such a disease is perhaps never seen in other arteries, its occurrence in the aorta is referred to its lining being more elastic than that of smaller arteries. See Dict. des Sciences Méd. t. ii. p. 112.

† Dr. Aug. Frid. Ayrer über die Pulsadergeschwülste, p. 19. Göttingen, 1800. Also C. D. Kuhln de Aneurysmate Externo, p. 4. 4to. Jenæ, 1816.

If a direct communication be formed between a large artery and its accompanying vein, as sometimes happens in venesection, when the lancet transfixes the vein and opens the subjacent artery, the wound in the skin may heal up, while the opening between the vein and artery may continue permanent, the arterial blood gushing into the former vessel at each pulsation of the heart, and producing in a very short time a remarkable varicose swelling, accompanied with peculiar symptoms. Such is the nature of the *varicose aneurism*, or *aneurismal varix.* Lastly, the *aneurism by* anastomosis*, is totally different from any of the preceding forms of disease, as it proceeds from a morbid growth, or dilatation of the arterial ramifications, by which a highly vascular substance is produced, which has a singular propensity to increase to a great and dangerous extent, and which, when cut or broken, bleeds with incredible obstinacy.

According to the observations of Scarpa, aneurism, in whatever part of the body it is formed, and from whatever cause it arises, is never occasioned by the dilatation, but by the rupture, or ulceration of the internal and muscular coats of the artery, and, consequently, these coats have not the smallest share in the formation of the aneurismal sac, which, he observes, is undoubtedly composed of the cellular sheath, which the artery receives in common with the parts contiguous to it. †

He completely disapproves of the division of aneurisms into true and false, as totally incorrect, not admitting, even as an exception, the case which I have mentioned, as accompanied with a dilatation of the external coat alone, and a rupture or ulceration of the middle and inner tunics.

At first, the reason of Scarpa's sentiment upon this latter point seems obscure, until he takes an opportunity of explaining, that he does not agree with the generality of anatomists in considering the covering of an artery as one of its proper coats, but merely as an adventitious sheath, or cellular investment, which the artery receives in common with the parts in the vicinity of which it runs. ‡ But, here the question seems, not about the state of what is called the *sheath* of the artery in a certain form of aneurism, but about the condition of its *external*, or *elastic coats*, in the same disease.

As Dr. Jones remarks, the external tunic derives from the particular arrangement of its component fibres a characteristic appearance, which distinguishes it from cellular membrane, and entitles it to be ranked as a *proper* coat of an artery. Having described its whiteness, density, great elasticity, &c., he then notices the *sheaths*, in which the arteries are contained while in their natural situations, and to which they are connected by means of fine cellular membrane. § Hence, when Scarpa specifies the invariable ulceration or rupture of the muscular and internal coats, in proof of the impossibility of a true aneurism, he is passing over that form of true aneurism in which the external coat of the vessel is dilated.

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* See John Bell's Principles of Surgery, vol. ii. p. 456.

† See Transl. by Wishart, p. 113.

‡ On the Anatomy, Pathology, &c. of Aneurism, transl. by Wishart, p. 69.

§ On the Process employed by Nature in suppressing the Hemorrhage from divided and punctured Arteries, &c. 8vo. Lond. 1805, p. 3.

The attention of several eminent surgeons has been of late particularly directed to the question before us, — whether any aneurisms really consist of a dilatation of the arterial coats, without a rupture or ulceration of all the three coats together, or of the two internal coats by themselves. The results of these investigations are quite adverse to the side which Scarpa has espoused; and the doctrine of true aneurisms, or aneurisms by dilatation, is still most respectably, and, I believe, successfully defended. * "My own observations (says Mr. Hodgson) will not allow me to coincide with Scarpa, in defining aneurism to be constantly produced by the destruction of the coats of an artery. On the contrary, the inspection of innumerable preparations of this disease, contained in the principal museums of this metropolis, and the more minute examination by dissection of various specimens of diseased arteries, and of aneurisms in the different stages of their formation, have produced a conviction in my mind, that, although in most aneurismal sacs, especially in those which have arrived at a considerable size, the coats of the vessel have given way, yet, in a great proportion of aneurisms, the disease commenced in a partial dilatation of the coats of the artery." We are not to suppose, however, that Scarpa means to exclude a preternatural dilatation from the catalogue of diseases to which the arteries are liable; on the contrary, in several parts of his writings, he speaks of a yielding of the arterial coats with a weakening of a part, or of the whole circumference of the artery. But, such morbid dilatation he always considers as a disease totally distinct and different in many particulars from aneurism. † The root of an aneurism of the aorta, says Scarpa, in whatever point of this artery it appears, never includes the whole circumference of the tube of the artery, but constantly occupies and involves only the one or the other side of the artery, from which side the aneurismal sac rises and enlarges in the form of an appendix or tuberosity, more or less large and extended, according to the circumstances of the place, or of the period of the disease; while, on the

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* Ueber die Pulsadergeschwülste von A. Scarpa; Zurich, 1808, mit Anmerk und Zusätzen von Christ. Fr. Harles, p. 299, &c. Hodgson's Treatise on the Diseases of Arteries and Veins, &c. 8vo. Lond. 1815, p. 59, &c. Kreysig, Ueber die Krankheiten des Herzens, theil ii. abth. 1. Berlin, 1815, p. 381, &c. Spangenberg, in Horn's Archiv. für Med. Erfahrung, 1815, heft. 2.

† Memoria sulla Legatura delle Principali Arterie degli Arti, con una Appendice all' opera sull' Aneurisma, p. 87, &c. fol. Pavia, 1817. Here I find Scarpa admits the occurrence of dilatation at a part of the circumference of the artery, — a point which, as appears from the quotation I next cite, he positively denies in the first part of his work. "Sometimes (says an accurate writer) the dilatation is partial, and occupies only one side of the vessel." Hodgson on Diseases of Arteries, &c. p. 47.

contrary, the dilatation of the artery occurs constantly in the whole circumference of the tube, and therefore differs essentially from aneurism.[*] The dilatation of an artery, he says, is not an affection, properly speaking, organic, as the blood is always contained within the cavity of the vessel; in the track of the expanded artery, no masses nor layers of grumous blood are ever found, as in aneurism; the dilatation never forms a tumour of considerable bulk; and, as long as the continuity of the proper coats of the artery remains uninterrupted, the circulation of the blood is not perceptibly changed.[†] There can be no doubt, I think, respecting the reality of the differences between aneurism and the dilatation of an artery, and that circumstances appearfully to warrant a distinction. Yet, I cannot omit this opportunity of condemning all attempts to generalize too much, — a desire which often leads men of the most distinguished talents into error. Thus, Scarpa not only contradicts himself, with respect to the question, whether dilatation always includes the whole periphery of the artery or not; but, he falls into another inconsistency, for we find him, in one place, asserting that by dilatation a swelling of large size can never be formed, yet, afterwards, himself adduces a morbid dilatation of the arch of the aorta, where the tumour was six inches in length and five in breadth.[*] The case is mentioned to prove the inaccuracy of the common conjecture, that coagulated blood is only found in large dilatations of the arteries, and not in smaller tumours of this nature. In the considerable swelling, here specified, there was not the least vestige of the lamellated coagulum, which is constantly found in aneurism.

In aneurism, the blood passes into a cavity, which is, as it were, out of the track of the circulation; there its course is retarded; and there it invaribly deposits lamellated coagula, and sometimes in such quantity as entirely to fill the cyst. If, says Scarpa, any breaches of continuity happen in the inner surface of a morbid dilatation, it is only within the cavities of such solutions of continuity and roughnesses that coagula are deposited[†], and all the rest of the inner surface of the disease is entirely free from them. These solutions of continuity and inequalities on the inside of a dilated artery, Scarpa very justly regards rather as the beginning of another disease, totally different from dilatation, viz. of aneurism formed consecutively to this latter affection. Mr. Hodgson, who has given a very correct account of the changes in a dilated artery, observes, that smaller sacs or pouches often grow from the sides of the great cyst, and are lined with a calcareous crust; and that, in other instances, the dilated coats appear to have given way at some point, and an aneurism is thus, as it were, ingrafted upon the dilated artery. *

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[*] In the appendix, p. 92., published 1817, Scarpa speaks of dilatations on the arch of the aorta, which were not larger than half a bean, and which, of course, could not affect the whole circumference of the vessel. These, however, are said to have had the other distinguishing characters of dilatation.

[†] See Scarpa's Treatise on Aneurism, transl. by Wishart, p. 56, 57.

[‡] Mem. sulla Legatura, &c. p. 90.

[§] See case in A. Burns on Diseases of the Heart, p. 206.

Besides these distinguishing characters of the two diseases, modern pathologists advert to others, not less worthy of notice. When the morbid dilatation of an artery is partial, or confined to one side of the vessel, resembling a thimble in shape, the opening through which the blood passes into the cyst is as large as the fundus of the cyst itself. And, when the dilatation occupies the whole circumference of the arterial tube, the tumour, thus produced, constantly has a cylindrical or oval shape; and if it be so situated as to admit of being compressed, it readily yields to the pressure, and almost disappears; while in the dead subject it seems much smaller than in the living. But aneurism, says Scarpa, presents entirely a different aspect. Whether preceded by a dilatation of the proper coats of the artery or not, its origin is always on one side of the vessel. Its neck, or that part, through which the blood must pass in order to get into its cavity, is more narrow than the rest of the aneurismal pouch. The swelling has an irregular shape, yields under pressure with difficulty, and is nearly of the same size both in the living and the dead subject. Lastly, while the preternatural dilatation of an artery is increasing in size, the proper coats of the vessel grow thinner and thinner; but in proportion as an aneurism gets larger, the thickness of its sac is augmented. †

When such cases are situated in the chest or abdomen, they cannot, of course, be distinguished from each other by the symptoms; but, fortunately, the means for palliating the two diseases, and retarding their sad consequences, are the same. The event of the two cases, however, may differ very much; for, as Scarpa remarks, if the case be an internal aneurism, some very slight hope may be indulged, that a radical cure will be effected by nature or art; which hope, however, can never be entertained in any instance of morbid dilatation. Experience proves, says he, that the *spontaneous* cure of an internal aneurism may happen, whenever the impetus of the circulation is lessened, and the lamellated coagula completely fill up the aneurismal sac. When this is accomplished, nature finishes the rest of the cure, just as she does when the main artery of a limb is tied; with this difference, that, in an *internal* aneurism, the coagulum shuts up the burst side of the artery, without intercepting the course of the blood through the vessel; while, in an *external* aneurism, the coagulum plugs up the sac and tube of the artery both together. This fortunate combination of things cannot be hoped for in cases of dilatation, because however diminished the force of the circulation may be, coagulated blood is never deposited in a pouch, that consists of a preternatural expansion of the proper coats of an artery.[*]

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* Hodgson, op. cit. p. 46.. also p. 72, &c.

† Scarpa in Memoria sulla Legatura delle Principali Arterie, &c. p. 93.

Whether aneurism begin with dilatation or not, in the end there is almost constantly a rupture or ulceration of all the coats of the artery. In most instances, the aneurism is formed by a destruction of the internal and middle coats of the vessel, and the expansion of the external coat into a sac, which at last giving way, the sheath of the artery and the surrounding parts form the boundary of the tumour. On the other hand, the sac which is formed by the dilatation of all the coats of an artery, as it advances in size contracts firm adhesions to the parts which are in its immediate vicinity; so that when the dilated coats give way, the effusion of blood is restrained by these adhesions, or rather by the timely effects of new adhesive inflammation, and, as Mr. Hodgson observes, the sac then continues to be formed in the same manner as when an aneurism is in the first instance produced by destruction of the coats of the vessel. Sometimes, however, the sac bursts so suddenly that the adhesive inflammation has not time enough to circumscribe the hemorrhage, and a diffused extravasation follows.[†]

A pulsating tumour, near a large artery, is always a sufficient reason for suspecting the disease to be aneurism; but, as other swellings, and even abscesses in the vicinity of an important artery, sometimes have a throbbing motion communicated to them by the neighbouring vessel, no positive judgment should be formed, until other circumstances of the case have been duly considered. I once saw a large abscess, at the side of the lumbar vertebræ, in a bluecoat boy, where the tumour pulsated with as much force as any aneurism which I have ever examined. An abscess, that occurred in a case of fractured sternum, had as regular a contraction and dilatation as the heart itself or the aorta could be supposed to have. Upon pressure, the tumour receded; upon a removal of the pressure, it immediately resumed its former size. At length it burst; discharged a considerable quantity of matter; and the patient recovered.[‡] In a case of glandular tumour, situated over the carotid artery, Sir A. Cooper readily distinguished the nature of the disease by the line of pulsation, caused by the artery, as the lateral parts of the swelling had no pulsation. He observes, that, when a tumour lies over an artery, and derives pulsation from it, the case may be discriminated from aneurism by raising the swelling from the vessel, by which means the tumour is deprived of its pulsation. In a doubtful case of aneurism in the groin, Mr. Brodie found all ambiguity cease on applying the stethoscope.[§] In order to discriminate certain pulsating tumours from aneurisms, writers direct us to recollect, that, in the first cases, the alternate rise and fall of the swelling amount to a real change of situation; while in an aneurism the motion proceeds from an alternate dilatation and contraction of the tumour at every point of it.* I confess, however, that the recollection of this fact has not seemed to me to facilitate the diagnosis in actual practice; for it is often equally difficult to pronounce, whether what we see is a displacement of the swelling, or only an expansion of it.

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[*] Scarpa, op. cit. p. 94—98.

[‡] See Hodgson on Diseases of Arteries, p. 71.

[‡] Warner's Cases in Surgery, 8vo. Lond. 1784, edit. 4. p. 155.

[§] Lectures, &c. vol. ii. p. 46.

In cases of diffused false aneurism, the pulsation is generally indistinct, and often quite imperceptible. Warner relates an instructive example of this total absence of pulsation. The case was a large diffused false aneurism. The thigh was enlarged to a very great size. The tumour was uniform, and extended from the inside of the knee to within a small space of the groin. The integuments were every where of their natural colour. The inside of the thigh was soft, and presented a kind of fluctuation; but not the least pulsation could be distinguished, either here, or at any other point. The tumour at its superior, posterior, and lateral parts, was of a stony hardness. It was judged advisable to make an incision into its most prominent part, when a stream of florid blood immediately gushed out, and evinced the true nature of the disease. As surgeons knew less then, than now, how aneurisms ought to be treated, the limb of the patient was immediately amputated. The diffused nature of this aneurism, and the large quantity of coagulated blood within it, which had acquired the texture and appearance of brown macerated leather, are circumstances fully accounting for the absence of pulsation.† Pelletan tells us of a case, where an axillary aneurism, that had no pulsatory motion, was opened from an idea that it was a collection of matter; but as the puncture was small, immediate death was prevented, by the application of sticking plaster.‡ I once saw a large popliteal aneurism which extended a good way towards the front of the limb, had a very solid feel, and not the slightest pulsation. The case was considered by many other surgeons, as well as myself, to be some kind of fleshy tumour, so involving the knee-joint as to admit of no other mode of extirpation but amputation of the limb. Previously to the operation, however, an abscess lancet was deeply plunged into the tumour, without giving issue to any fluid.§ This was an instance, in which the absence of pulsation had been caused by the cavity of the aneurism being nearly filled with coagulated blood; and if we had not formed a wrong judgment of the nature of the disease, but left the case to itself, the popliteal artery might soon have become impervious, and a spontaneous cure followed.

A true aneurism, in an external situation, generally presents itself in the form of a small pulsating tumour, which subsides under pressure, and immediately re-appears when the pressure is taken off. It also subsides, or at least becomes more flaccid, when the portion of artery between it and the heart is compressed; but immediately resumes its usual fulness and pulsation when such compression is discontinued. In other tumours, which derive a pulsatory motion from their lying over a large artery, pressure made on the vessel completely stops their alternate elevation and depression, but they remain as tense and prominent as ever, which is not the case with aneurism. True aneurism, in its commencement, is generally little painful; and the integuments are of their natural colour. The pulsations are strong, especially while the tumour is small, and none of the coats of the vessel are yet ruptured, because, in this stage, the blood in the sac is all fluid, and no lamellated coagula are deposited upon its inner surface. The greater strength of the pulsation in true aneurisms also depends very much upon the ample and direct communication between the sac and the direct channel of the blood. In a more advanced stage, as Sir Astley Cooper has explained, the tumour is larger and more solid, and the sac cannot be completely emptied. A part of the blood in it has coagulated, and its parietes have become much thickened. The size of the swelling, and its pressure on the surrounding parts, now create pain, and obstruct the circulation. The pulsation, however, though not so strong as at first, is yet distinct. In a still further advanced stage, the size and solidity of the aneurism are more increased; the pulsation is very indistinct, and only to be felt at that part of the tumour which is opposite to the orifice in the artery. The sac is now almost filled with lamellated coagula, and contains but a small quantity of fluid blood.*

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* Dict. des Sciences Med. t. ii. p. 91.

† Warner's Cases in Surgery, p. 159.; in which work are recorded two other instances of aneurism without pulsation.

‡ Clinique Chirurgicale, t. ii. p. 84.

§ Lawrence in Medico-Chir. Trans. vol. viii. p. 497.

With respect to the diffused false aneurism, it generally presents but a feeble and indistinct degree of pulsation, and this only near the situation of the aperture in the artery. In consequence also of the extensive injection of the cellular membrane with blood, the case is at the same time attended with more discolouration, than any other form of aneurism, unattended with inflammation. The history of the disease; its cause; its sudden formation, &c., also serve to throw light on the diagnosis.

Nor is the diagnosis of what is named the secondary false aneurism difficult; for, when a case, which has been for some time attended with the symptoms of true aneurism, and restricted to a certain form, suddenly undergoes an alteration of shape, and an increase of size, either becoming more protuberant at one or more points, or more extensively diffused, (in the latter case, with a material decrease or loss of pulsation,) we have great reason to suspect, that a secondary false aneurism has been formed by the bursting of the original aneurismal sac.

By the pressure of large aneurisms an absorption is caused of all the surrounding textures, whether bone, cartilage, muscle, &c. It is curious, however, to remark with respect to the bones, that however they may suffer in this way in case of popliteal aneurism, their condition rarely gives any trouble after the aneurism itself has been cured. This kind of caries is also peculiar in never being accompanied with suppuration: it is a simple absorption of bone.

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* Sir A. Cooper's Lectures, vol. ii. p. 25.

From the increasing size of an aneurism, it produces in time severe suffering by compressing large nerves, and even pushing them quite out of their natural situation. In internal aneurisms, in particular, a variety of evils may arise, as difficulty of deglutition from the pressure on the œsophagus; complaints of the urinary organs, from pressure on the bladder; vomiting from pressure on the stomach; difficulty of respiration from pressure on the lungs, or diaphragm; or, suffocation from pressure on the trachea. Large external aneurisms also generally produce, besides great pain, a serious impediment to the passage of fluids through the lymphatics and veins of the limb, which sometimes becomes enormously enlarged by an œdematous effusion.

When an external aneurism is about to burst, the event may be foreseen by a part of the tumour becoming particularly tense, raised into a conical prominence, something like the pointing of an abscess, and presenting a thin soft feel, and a dark purple colour. On the apex of this projecting part the cuticle separates and a small slough forms, which generally spreads till it is of about the size of a sixpence or shilling; and at length being loosened, or detached with the adjoining coagulum, is followed either by one copious and sudden gush of blood, that destroys life in a few instants, as I saw happen in a case of subclavian aneurism, or by repeated hemorrhages, by which the patient is more gradually exhausted. I have seen two or three cases, in which this mode of rupture was exemplified, and its correctness is confirmed by the corresponding reports of some of the best writers on aneurism.* According to Mr. Hodgson, when an aneurism bursts into a cavity which is lined by a mucous membrane, like the œsophagus, intestines, bladder, &c. the breach is also produced in the same way; but when the sac projects into a cavity lined by a serous membrane, as the pleura, the peritoneum, and the pericardium, these membranes, after being rendered extremely thin, give way by laceration.

With respect to the causes of aneurism, there can be no doubt, that, with the exception of those cases which proceed from wounds, the generality of instances are preceded either by a steatomatous thickening, with ulceration of the internal coats of the artery, or by calcareous deposition between the middle and internal coats, attended with loss of elasticity in the affected part of the vessel, and a disposition to crack or give way. The blood then comes into contact with the external elastic coat, which is raised into an aneurismal swelling. At length, more or less of this coat is removed by absorption, or bursts, and the blood then receives a covering from the arterial sheath. As the disease advances, it presses upon, and causes the absorption of all the surrounding parts, and is more or less diffused or circumscribed, according as it may happen or not to be confined or bounded by an entire cyst, formed by the adhesive inflammation, the remains of the original sac, or any ligamentous expansion.

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* Pelletan, Clinique Chir. t. ii. p. 91. Hodgson on Diseases of Arteries and Veins, p. 85. Sir A. Cooper's Lectures, vol. ii. p. 26.

In works of the greatest accuracy, we find accounts of aneurisms which arose from violent efforts, forcible pressure on arteries, the reiterated bruising of parts, the force employed in reducing a dislocated humerus, the violence of falls, fractures, wounds *, &c. With the exception [of cases, however, in which arteries are wounded with a sharp instrument, the point of a fracture, &c. together with other soft parts, aneurism seldom proceeds from external violence, unless the coats of the vessel be already in an unsound state. Mr. Hodgson never met with the laceration of the coats of an artery which had not undergone some previous morbid alteration, nor does he think it probable, that any exertion, which did not lacerate the surrounding parts, could be sufficient to rupture the coats of a healthy vessel. He also ascertained by repeated experiments the inaccuracy of Richerand's statement,† that the inner coats of the healthy popliteal artery may be ruptured by violent extensions of the leg, since the laceration never happens, unless the extension be made in such a degree as to break the ligaments of the knee-joint. ‡

As aneurism occurs more freqently in the large, than the small arteries, it is evident, that the impetus of the blood must frequently have a considerable share in its origin. True aneurisms, as Monro thought, take place as often in the aorta, particularly its arch, as in all the other arteries together. Aneurisms also frequently occur in the ham, and wherever the arteries run unsurrounded by muscles, and are most exposed to external violence.

Patients frequently have several aneurisms at the same time. I have seen patients, who either had more aneurisms than one at the same time, or who had had other aneurismal tumours before those which I had the opportunity of observing. Sir A. Cooper has seen seven in one person.§ But, the most remarkable example of a multiplicity of aneurisms is mentioned by Pelletan, who counted in one subject sixty-three, from the size of a filbert, to half that of a hen's egg. ||

The experiments of Mr. John Hunter, and Sir E. Home, decidedly prove, that a mere local weakness of a part of an artery, otherwise healthy, will not occasion the formation of aneurism. Even dissecting off the outer coats of an artery will not cause it.¶

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* See Pelletan's Clinique Chir. t. i. and ii.

† Nosographie Chir. t. iv. p. 78.

‡ Hodgon, p 64.

§ Lectures, vol. ii. p. 57.

|| Clinique Chir. tom. ii. p. 1.

¶ See Trans. of a Society for Med. and Chir. Knowledge, vol. i. p. 144.

Nor is the sudden laceration of the internal and middle coats of a sound artery ever the cause of aneurism: this fact is completely proved by the experiments of Dr. Jones, as well as by what happens in the practice of surgery, where small ligatures are now so commonly employed, and sometimes have even been taken off immediately after being applied, so as to leave the cut part of the internal coats exposed to the impetus of the circulating blood. This point, I think, is well deserving attention, because the opponents of Dr. Jones's doctrines have laid some stress on the danger either of aneurismal dilatations, or the too speedy ulceration of the artery, from the effect of a small ligature in dividing the inner coat of the vessel. As when the ligature is left on the artery, a coagulum forms within it, and fluid blood no longer comes into contact with the solution of continuity, some surgeons may be inclined to impute the prevention of the dilatation of the external coat to this occurrence; but the thing cannot be entirely owing to such cause, because we find, that when the ligature is taken off immediately after its application, and the current of blood is allowed to proceed as it did previously, no aneurism is the consequence. We must, therefore, conclude, that the formation of aneurism, except where all the coats of an artery are pierced, or cut, must generally be preceded by a morbid change in them; a fact, fully confirmed by what is disclosed to us in dissection.

DIFFERENT PROCESSES BY WHICH ANEURISMS ARE CURED.

Although it is the common course of aneurisms, when they are left to themselves, to increase in size, and at length to burst and destroy the patients by hemorrhage, sometimes things happen otherwise, and, in consequence of certain changes taking place, a spontaneous cure is the result. There are four modes, in which this desirable event may be produced. 1. Sometimes the whole aneurismal swelling suddenly inflames and sphacelates: in this state, if the inflammation extend its effects to a sufficient depth, the sac in the vicinity of the artery, and a portion of the canal of this vessel itself may become completely blocked up with coagulating lymph, so that no more blood can get into the tumour, the pulsation of which is suppressed. In cases of this description, the mortified parts, together with the mass of congealed and sometimes putrid blood in the sac, are cast off, and if the patient's constitution hold out, the ulcer, left by the detachment of the sloughs, heals up, and the cure is completed. When, however, the inflammation and sloughing are confined to the skin and superficial portion of the sac, the patient bleeds to death on the separation of the dead part. 2. The second process, by which the spontaneous cure of an aneurism may be produced, is the increase of the lamellated coagula in such a degree within the aneurismal sac, as completely to fill it, in which case the blood also coagulates in the adjoining portion of the artery, which becomes impervious for a certain extent above and below the communication, which it had with the vessel. Similar changes happen when the cure is accomplished by pressure. 3. Scarpa and all the best modern surgical writers, until lately, supposed, that no aneurism could be cured, unless the sac and an adjoining part of the artery were thus obliterated: the facts, however, collected by Mr. Hodgson * leave no doubt, that when an aneurism of the aorta undergoes a cure, the sac alone may be filled up with coagula, while the vessel itself remains pervious. 4. The last manner, in which spontaneous cure may be brought about, is by the pressure of the aneurismal sac itself upon the artery. In one instance on record, this fortunate pressure of the sac followed four days after the change of a popliteal aneurism from a circumscribed to a diffused state. †

As it is from the increase of coagulated blood within the tumour that the patient, generally speaking, has the best chance of a spontaneous cure, it must of course always be a desideratum to prevent the sac from becoming very large, which would lessen the probability of its cavity becoming entirely filled up with lamellated coagula. Sometimes, however, even when the tumour is of vast size, certain changes happen, by which the mouth of the sac is blocked up, the swelling loses its pulsation, and a cure ensues. But the best plan is always to resist as much as possible the increase of the tumour; and since its enlargement and ultimate rupture are caused by the force of the circulation, one grand principle, whenever we aim at promoting a spontaneous cure, must necessarily consist in lessening the impetus of the circulation.

TREATMENT OF ANEURISMS.

In aneurisms of the aorta, debilitating remedies, abstinence, a milk diet, occasional bleedings, the exhibition of digitalis, and the avoidance of all exertion, have been the means commonly recommended, rather with an expectation of retarding the disease, than of effecting a cure. The facts, however, which modern experience has adduced in favour of the efficacy of a treatment first proposed by Valsalva, are certainly such as to justify a confident belief, that many internal aneurisms, even though large and much advanced, are capable of palliation, reduction, and cure. The cases, published by Pelletan, furnish the most convincing evidence, that vast aneurisms of the aorta, so large as to project through the absorbed part of the ribs and sternum, may sometimes be reduced and cured by Valsalva's method. Together with repeated bleeding, strict quietude, and a very spare diet, Valsalva recommended ice, or compresses wet with a cold lotion of vinegar and water, to be applied to the swelling. By such treatment, Pelletan effected the

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* Treatise on the Diseases of Arteries, &c. p. 117. et seq.

† Sir A. Cooper's Lectures, vol. ii. p. 47.

cure of a subclavian aneurism.* In aneurisms of the aorta, bleeding so as to induce fainting, is extremely dangerous†: the blood, therefore, should be taken away slowly, and in little quantities at a time.

The principle, on which external aneurisms are usually cured, consists in preventing the entrance of fresh blood into the aneurismal sac; for when this is accomplished, the blood, already contained in the sac, is gradually absorbed, the sac itself contracts, the whole tumour diminishes, and, by degrees, the power of using the limb is restored. The stoppage of the influx of blood into the sac, may sometimes be fulfilled by the skilful application of pressure, particularly while the aneurism is small, and its contents can be made to recede. But, although it may be generally proper to try pressure in the early stage of the disease, it cannot be said that the practice is attended with considerable success. I should suppose, indeed, that it does not answer in more than one case out of thirty; and a certain proportion of the successful instances on record are, no doubt, rather examples of a spontaneous cure. On the whole, I am of opinion, that there is no inducement to make a long trial of pressure in any case of aneurism, and that when the disease is already large, and increasing with rapidity, it is better not to waste time upon the experiment. There can be little doubt, however, that pressure would more frequently cure the disease, if it could be made to operate effectually upon a given point of the artery, before this vessel reaches the aneurismal sac. The plan has many times been attempted, and ingenious compressing instruments devised; but, unfortunately, the large nerve, which usually accompanies every artery of importance, must also be compressed, and the agony which the patient experiences is so great as to compel the surgeon to relinquish the project. Another common cause of failure proceeds from the artery not admitting of being efficiently compressed against a firm surface underneath it: consequently, the circulation through the vessel still goes on, and the adhesive inflammation of its inner coat is not excited. Another plan of applying pressure consists in bandaging, with as much equality as possible, the whole limb inclusive of the swelling. Such is the method to which Genga‡, Theden§, and Scarpa‖, give the preference. Here it seems as if the aim were rather to lessen the impetus of the circulation in the member generally, and promote the coagulation of the blood in the sac, than at once to stop the main flow of this fluid into the cavity of the aneurism; as is done either when the artery is compressed, or tied, above the aneurismal swelling. Whenever pressure is tried, the experiment should be conjoined with a low regimen, venesection, the exhibition of digitalis, and the application of ice, or cold lotions to the tumour. In this branch of surgery, however, it is highly necessary never to be unmindful of the dangerous consequences of immoderate and long continued pressure; a subject on which I have offered several cautions in the chapter on mortification.

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* See Clinique Chirurgicale, par P. J. Pelletan, tom. i. Mém. sur les Aneurismes Internes. Paris, 1P10.

† Hodgson, p. 151.

‡ Anatomia Chirurgica, p. 219.

§ Bemerk. und Erfahrung, 1. Th. Berl. 1778.

‖ Treatise on the Anatomy, Pathology, &c. of Aneurism, transl. by Wishart, p. 204. 231. 337, &c.

POPLITEAL ANEURISM.

The surgical methods of cure are only two, viz. compression, and the ligature. As Scarpa has observed, compression is not a mode in which much confidence can be placed, except when the rupture of the artery is owing rather to an external cause, than to disease and ulceration of the arterial coats; when the two opposite parietes of the lacerated artery in the ham admit of being pressed against the inferior and posterior surface of the thigh-bone; and when the degree of pressure, which can be employed, is sufficient to excite deeply in the proper coats of the popliteal artery the adhesive inflammation, by which the artery is finally converted into an impervious ligamentous substance. The combination of these three circumstances is a rare occurrence. For, if we suppose what is seldom the case, that the coats of the artery have not been too much diseased, previously to their giving way, to admit of inflaming and adhering together, there are yet many other difficulties, which prevent the surgeon from applying to the artery that exact and steady degree of pressure, which is requisite for the complete and radical cure of the aneurism in the ham. The compressing force on the aneurismal sac must press down and remove from the artery the concentric coagulated layers of blood, so that the pressure may fall precisely on that portion of the vessel immediately above its rupture. This, says Scarpa, cannot take place except in a case of very recent popliteal aneurism, of small size, where the coagulated blood can be made to descend below the place which we wish to compress. Besides this, it is necessary that the compression should not injure the great sciatic nerve, especially its large tibial branch. This is very difficult to avoid, because the nerve runs on the back of the aneurismal sac, and is superficially situated, immediately below the integuments and aponeurosis of the ham. Strong pressure on the nerve, also, renders this mode of cure insupportable. Nor can the plan answer, if the breach in the artery be too high up, where the femoral artery passes through the tendon of the triceps, or too low down, under the heads of the great muscles of the calf of the leg, where the vessel divides into the tibial arteries. In both these situations, pressure cannot be made to operate effectually in holding the parietes of the artery at the necessary point in close contact. Were the pressure powerful enough to force the artery against the posterior surface of the tibia, when the rent in the artery is low down, the obstruction of the inferior articular and tibial arteries, and gangrene of the leg, would be the inevitable consequences.

Such considerations induced Scarpa to lay down the following practical rules: compression is not advisable when the popliteal aneurism is spontaneous, or not depending upon a wound, or violent stretching of the artery; when the aneurism is of long standing, and of large size; when it occasions acute pain and sympathetic fever; when it produces considerable swelling of the leg and foot, with a diminution of their heat; and when the sac is situated too high or too low in the ham. On the contrary, a trial of compression is proper, when the popliteal aneurism is very small, recent, and produced by a violent stretching of the artery; when it is indolent, soft, and yields to the pressure of the hand; when it is situated exactly in the middle of the cavity of the ham; and when it is not accompanied by swelling, or numbness of the leg and foot. But, however favourable circumstances may seem to a trial of pressure, if it be found to excite severe pain, or swelling and torpor of the leg, it should be immediately given up.*

The operation for the popliteal aneurism consists in suppressing, by means of the ligature, the course of the blood through the popliteal artery, so that the current of blood, which passed by this artery, is conveyed to the leg and foot by the different channels of the lateral anastomosing vessels. The effect, in respect to the primary indication which the surgeon proposes to accomplish, is the same, says Scarpa, whether the artery be tied in the ham, a little above the breach in the vessel; whether the ligature be applied on the inner side of the thigh, in the middle, or at the top of the thigh; that is to say, we intercept the flow of blood through the popliteal artery into the aneurismal sac; and successively obtain the obliteration and conversion of the diseased artery into an impervious ligamentous cord.†

We are indebted to Mr. John Hunter‡ for the greatest improvement ever made in the mode of operating for aneurism, and, more especially, the popliteal aneurism. He saw that much of the ill success of the old method arose from the severe practice of laying open the swelling, and tying the artery in the ham; a situation where it was least likely to admit of the adhesive inflammation, by which the vessel was to be obliterated. He was led, therefore, to try the infinitely better plan of taking up the femoral artery above the middle of the thigh, or at some distance from the point where the vessel perforates the tendon of the triceps muscle, and of then leaving the tumour to be lessened by absorption, instead of laying it open. In short, the operation, as practised by the best modern surgeons, consists in making an incision about two inches and a half in length through the skin and fascia of the thigh, precisely over the course of the artery in its descent within the inner edge of the sartorius muscle. Scarpa recommends us, however, to make the incision in the upper third of the thigh, or a little higher than the situation which Mr. Hunter selected, and his reasons for this alteration appear judicious. First, we thus avoid the necessity of removing the sartorius from its position, or of turning it back, for the purpose of getting at the artery. I have frequently seen the best operators, even professed anatomists, embarrassed by the sartorius being immediately in their way, when they had cut through the integuments and fascia. Secondly, the artery is more superficial a little higher up, than in the place usually chosen. And, thirdly, as being further from the disease, it is more likely to be sound, and in an advantageous state for the effects of the ligature.

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* Scarpa, transl. by Wishart, p. 227—231.

† Op. cit. p. 235.

‡ See Trans. of a Society for the Improvement of Med. and Chir. Knowledge, vol. i. art. 9.

It is a point of considerable importance in operations for aneurism to avoid all contusion, disturbance, and unnecessary handling of the part of the artery which we are about to tie; for thus we lessen the chance of the vessel inflaming too violently, and ulcerating, so as to give rise to secondary hemorrhage, which is the chief danger to which the patient is exposed. The organization of the blood vessels being similar to that of other soft parts, they must be subject, like these other structures, to inflammation, ulceration, and sloughing. They are themselves vascular, and derive their nourishment from vessels (the vasa vasorum) transmitted to them from the parts which are immediately around them. Hence the advantage of separating the part of the artery which we are about to tie, as little as possible from its surrounding connections. In other words, the ligature should always be applied round an artery, as near as possible to the place in which the vessel lies amongst its natural attachments. For many valuable observations in support of this principle, now universally approved, the profession are indebted to Mr. Abernethy.*

In particular, we should keep this principle constantly in view in our next proceedings. We have divided the skin and fascia, and can feel the artery beating under our fingers. The next object is to divide the cellular membrane, till we can see the sheath of the vessel. We are now not to separate the artery to such an extent from the surrounding parts, as will allow us to put our finger under it, a practice which is a serious infringement of the principle above recommended, and on no account necessary, but we should cautiously make a slight puncture or scratch on each side of the undisturbed, undisplaced artery, and then pass a ligature with an eye-probe, or aneurism-needle under the vessel, observing not to include the femoral vein, and accompanying branches of the anterior crural nerve. The ligature is next to be firmly tied, one end of the ligature being afterwards cut off close to the knot, and the other left hanging out of the wound, the edges of which are to be immediately brought together with adhesive plaster.

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* Surgical Works, vol. i.

If the operator prefer, however, to tie the artery with a ligature composed of fine dentist's silk, *he may then cut off both ends of it*, close to the knot, and endeavour to heal the wound by the first intention. This method I have seen followed by Mr. Lawrence; and, in another case, in which Mr. Carwardine, of Thaxted, operated, and the practice was tried, the whole wound healed by the first intention, not a particle of pus was formed, and the cicatrix continued sound.*

There have been several variations made in the operation by different surgeons. Thus Scarpa still prefers avoiding to use the ligature in such manner as to divide the inner coats of the vessel, and, in order to prevent this effect, imitates Paré, Heister, and Platner, by interposing between the artery and the ligature a small cylinder of waxed linen. His advice on this point, however, has produced few or no converts to it in this country, where the principles established by Dr. Jones universally prevail. Since the practice of tying arteries with small ligatures came into vogue, and surgeons have taken care not to separate the artery too much from its natural connections, and not to irritate it with the presence of any extraneous substances, in addition to a single small ligature, the frequency of secondary hemorrhage has been surprisingly lessened, and operations for aneurism attended with the most brilliant success.

In the chapter on hemorrhage, I have adverted to some of the arguments which Scarpa has employed in defence of his precept, that, in tying the artery, we should avoid applying the ligature so as to cut through the inner coats of the vessel, and, therefore, should interpose between it and the noose a roll of linen. In the appendix to his great work on aneurism, he has also introduced an account of some experiments made by Professor Mislei, with a view of ascertaining whether ulceration of an artery is produced more quickly by the noose of a small ligature, or by the noose of a somewhat larger one, with the interposition of a roll of linen between it and the vessel. The tenor of these investigations is to prove, that the simple noose of a fine ligature produces ulceration of the external coat too rapidly, and creates a danger of secondary hemorrhage. Mislei details a case, in which he first tied the carotid of an old emaciated diseased mare, with a single ligature: but four-and-twenty hours afterwards hemorrhage took place. He exposed the artery therefore without delay, and applied a simple circular ligature above the aperture in the vessel, and below it a ligature with the interposition of a cylinder of linen. Thirty-nine hours afterwards, the simple circular noose was removed, and at the end of eighty-seven hours, the other ligature, with the roll of linen, was gently taken away. Twelve days after the removal of the first, the animal perished of hemorrhage from the superior angle of the wound.* This case is considered by Mislei as a complete proof of the superiority of the method of interposing a cylinder of linen between the artery and the ligature. When we carefully read over the particulars, however, we see that the animal, which was the subject of experiment, was in a very unfavourable state for the investigation, being very aged and diseased, with the artery in an ossified condition, highly unpropitious to the access of the requisite healthy kind of adhesive inflammation for the obliteration of the vessel in the situation of the ligature. There was also a good deal of handling, disturbance, and irritation of the vessel in the different proceedings which were adopted; a cause quite adequate to account for the secondary hemorrhage. I do not, however, attempt to explain why the bleeding happened to come from the part of the artery which had been tied with a simple circular ligature, and not from the other part, which was tied by the interposition of a roll of linen. One part might have been more exposed and irritated, and more detached, than the other, from its natural connections. At all events, no positive conclusion is to be drawn from one experiment, and that too neither performed on the artery of a human subject, nor on the sound artery of a healthy animal.

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* Med.-Chir. Trans. vol. viii. p. 492.

On the continent, one or more ligatures of reserve are sometimes put loosely round the artery, above the first ligature with which the vessel is tied. These ligatures of reserve are meant to be tightened, in the event of secondary hemorrhage. But, when it is considered how much the artery must be detached from its surrounding connections by any supernumerary ligatures, and how likely these extraneous bodies are themselves to cause irritation of the wound, ulceration of the artery, and secondary hemorrhage, the danger of this practice is a very good reason for its rejection. Not one judicious surgeon in this country now remains an advocate for ligatures of reserve.

Œtius, Celsus †, Tenon, and others, mention the plan of tying the artery with two ligatures, and cutting through the intervening portion of the vessel; a practice, which was revived about the same period by Mr. Abernethy, and Professor Maunoir, of Geneva. The former thought this method would leave the artery, as nearly as possible, in the same state in which it is on the surface of a stump; and that secondary hemorrhage from the femoral artery would then not be more frequent after an operation for a popliteal aneurism, than after amputation. ‡ But, as Mr. Hodgson observes, an artery tied in two places, and divided in the interspace, cannot be regarded as placed exactly in the same condition as an artery tied in amputation. In the latter case, the retraction of the vessel corresponds with that of the surrounding parts, which are divided at the same instant, and, therefore, its relative connections stand as before the operation. But, in the operation for aneurism, the retraction of the artery takes place without being attended with a corresponding retraction of its connexions. How far the retraction of the artery is beneficial or injurious is by no means evident; and if it be supposed useful on the principle of hindering any tension of the artery, this fancied good may be obtained by simply laying the limb in a bent position. * If, then, this method has no particular recommendation, its present decline cannot but be right on the principle of lessening the quantity of extraneous substance in the wound. In fact, few good operators now prefer two ligatures to one. The only circumstance, in which this practice is decidedly advantageous, is where the artery has been too extensively separated from its natural connexions; for then one ligature may be applied at the upper end of such detached portion of the vessel, and the other at the lower; so that they will both lie closely to the points at which the artery begins to be surrounded by its natural connexions again.

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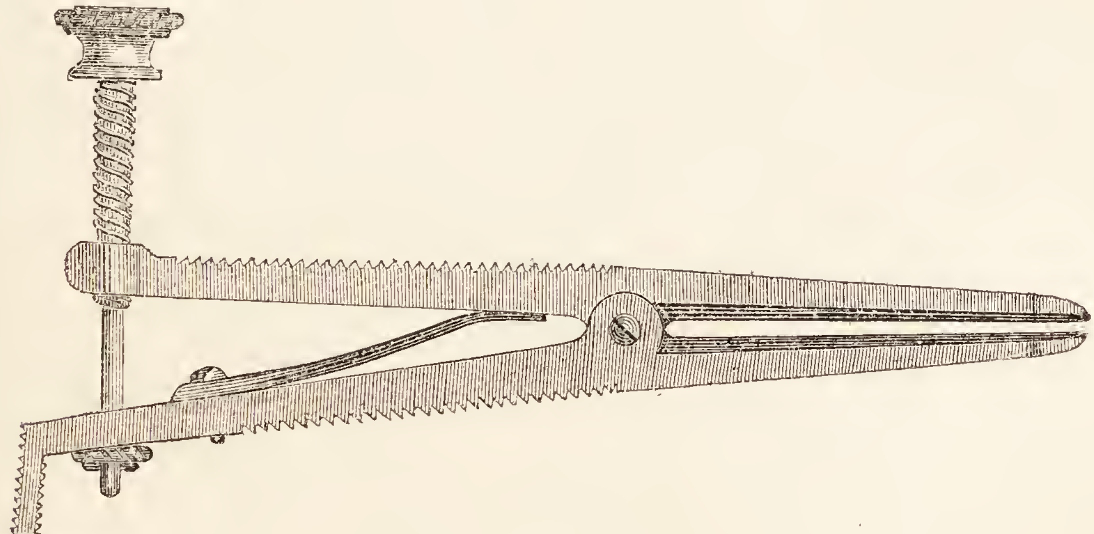
* See Scarpa's Memoria sulla Legatura delle Principali Arterie degli Arti, con una Appendice all' Opera sull' Aneurisma, p. 75. Pavia, 1817.

† Lib. v. cap. 26.

‡ See Abernethy's Surgical Works, vol. i. p. 227, &c.

Having already declared myself to be no admirer of the practice of compressing the artery between a cylinder of linen and the ligature, I can entertain no favourable opinions of any other analogous modes of operating, as executed with the presse-artère of Deschamps, the serre-nœud of Desault, or the instrument proposed by Mr. Crampton. Nor do I hesitate to deliver the same judgment, respecting the plans of compressing the artery between two metallic surfaces, as we see exemplified in the use of the pincers of Baron Percy, and Assalini's compressor.



In the chapter on hemorrhage I have noticed the expectations which were one raised by the interesting experiments of Dr. Jones, that, if a smallish ligature were tightly applied round an artery, the cord might be immediately afterwards removed, and still the tube of the artery become impervious. Had this hope been realized by later investigations, the surgeon would then have had

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* On Diseases of Arteries, p. 222.

no extraneous substance in the wound, which would have had a better chance of healing by the first intention, while the risk of secondary hemorrhage from ulceration of the vessel, induced by the irritation of the ligature, would have been entirely removed; but, unfortunately, the momentary application of a ligature is not found to be always, or even generally, followed by an obliteration of the tied part of the vessel.

Mr. Travers [*] conceived, that if the ligature were applied a certain time, and then removed, it might simplify the practice employed by surgeons for obliterating the larger arteries; but, further observation has led him to renounce the plan. Sir A. Cooper in one case tied the femoral artery very firmly, and loosened the ligature after thirty-hours; but, in half a minute, the aneurism began to pulsate as strongly as ever again. The ligature was, therefore, tightened for forty two hours longer, and the pulsation did not return. Thirteen days afterwards hemorrhage occurred; but it was stopped by the tourniquet, and a cure followed. In a case of radial aneurism, this method failed in hindering the return of pulsation when the ligature was loosened at the end of twenty-four hours, and the common operation was judged advisable.[†] Scarpa, however, continues an advocate for the removal of the ligature, as soon as the closure of the artery is sufficiently advanced to obviate all chance of its becoming pervious again, and it is strong enough to resist the impetus of the blood. He represents this period to be on the third or fourth day after the operation, when he recommends us to remove the ligature altogether, and not wait for its spontaneous detachment, as its longer continuance, he conceives, is of no further use, and may sometimes cause ulceration at the principal point of adhesion between the sides of the artery.[‡] Although I fully agree, that a sufficiently firm closure of the vessel must generally have taken place long before the time when a ligature is spontaneously detached, yet, I apprehend, that if the momentary application of the cord will not suffice, we shall never derive any solid advantage from not awaiting its natural separation. If the ligature could be taken away directly after its first application, then we should be able to close the wound, and attempt to heal it by the first intention, and this with increased chances of success, inasmuch as the case would not be complicated with the presence of any extraneous substance. But, unless the thing can be done in the first instance, we must, in order to be enabled to cut off the ligature, lose all the advantage of the chance of union by the first intention.[§] In attempting to remove the ligature, there must also be some danger of tearing the recent adhesion, and thus producing hemorrhage.

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[*] See Med.-Chir. Trans. vol. iv. p. 435, &c.; also vol. vi. p. 632—643, &c.

[†] Lectures, vol. ii. p. 55.

[‡] See Memoria sulla Legatura delle Principali Arterie, &c. p. 51, &c. &c. Pavia, 1817.

[§] See Quarterly Journal of Foreign Medicine and Surgery, vol. i. p. 29. Lond. 1818.

When the weather is very cold, or the temperature of the limb sinks after the operation, flannel should be applied. Pressure on the heel is to be prevented, as it is apt to produce a gangrenous spot on it; and perfect rest is to be observed, both while the ligature remains, and for three or four days after its separation, so that the wound may have the best chance of healing by the first intention, and all risk of the newly-closed artery bursting may be avoided.*

OF FEMORAL ANEURISMS SITUATED HIGH UP THE LIMB.

Not many years ago, cases of this description were deemed incurable by any surgical operation, and, perhaps, until the present time, the same opinion might have prevailed, had not Mr. Abernethy † exemplified the possibility, not only of successfully tying the femoral artery above the giving off of the profunda, but even the external iliac artery itself higher than Poupart's ligament, and, as it were, within the abdomen. When we hear from a register of cases, in which this bold and judicious proceeding has been adopted, that out of twenty-two fifteen were cured ‡, we must dispel all fear about the limb being left without other adequate channels for the continuance of the circulation. Indeed, the numerous instances, in which the external iliac artery has now been tied, fully warrant the conclusion, that the limb is not in more danger of mortifying after the ligature of this vessel, than after that of the femoral artery below the profunda; and the several opportunities, which I have had of seeing the external iliac tied, have left not a doubt in my own mind, that the success of the operation would have been still greater, had it been done in some cases at an earlier period, before the tumour had become very large, and the health materially impaired by long confinement. No doctrine, I think, is more pernicious than that, which inculcates delay for the unnecessary object of giving the anastomoses time to enlarge: for these are always ready to do their office, if they be not prevented by the effects of the distention and pressure of an enormous tumour. The truth of these remarks was strikingly displayed in the ever-memorable case of inguinal aneurism, in which the human aorta was tied: for, notwithstanding the ligature of this vessel above its bifurcation, the blood found its way with ease into the limb, which was not on the same side of the body as the disease; but, on this side, the same desirable circumstances seem to have been impeded by the obstruction produced by the pressure and effects of the tumour.§ In order to take up the external iliac artery, the integuments are to be divided in the direction which this vessel naturally takes in its descent to pass out of the pelvis. In an adult, the incision of the integuments is to begin half an inch below the superior spinous process of the ilium, and an inch and a half from the same process towards the linea alba. From the point here specified, the wound is to be carried down nearly as low as the femoral arch, but not lower, in order to avoid injuring the spermatic cord and epigastric artery. The aponeurosis of the external oblique muscle, at the bottom of the wound, is to be divided to the same extent. The point of the finger is then to be introduced into the lower angle of the incision, and, under its guidance, the layers of the internal oblique and transverse muscles are to be cautiously divided, particular care being taken not to hurt the subjacent peritoneum, which serious accident may be avoided by pressing this membrane a little back with the finger where it first makes its appearance under the divided aponeurosis of the transverse muscle. The finger will now be in immediate contact with the external iliac artery in the vicinity of the lower angle of the wound, and a little above the origin of the epigastric, at the exact point at which the former vessel rises from the side of the pelvis, to pass over the horizontal ramus of the os pubis *, where it makes another turn to descend under the femoral arch to get to the bend of the thigh. At that point, after the vein has been separated from the artery by means of the end of a director, a single ligature is to be passed with an eye-probe, or aneurism needle, under the artery, and firmly tied. It is observed, that the situation of the latter vessel over the vein, at the point above described, is a circumstance materially facilitating the application of the ligature. † In general, however, surgeons tie the external iliac artery rather higher than the point here specified, and the vein then lies on the inner side of it.

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* See Sir A. Cooper's Lectures, vol. ii. p. 58, 59.

† Surgical Works, vol. i. p. 227, &c.

‡ Hodgson on the Diseases of Arteries, &c. p. 417.

§ Surgical Essays, by A. Cooper and B. Travers, p. 114, &c.

ANEURISM AT THE BEND OF THE ARM.

In operating on aneurisms of the brachial artery, former surgeons always deemed it necessary to tie the vessel both above and below the swelling. They thought that one ligature, above it, would not be sufficient, by reason of the freedom with which the blood would get into the sac, through the inosculations between the collateral and recurrent arteries. Scarpa has explained, however, that one ligature, above the tumour, is quite enough. An incision is to be made along the inner edge of the biceps muscle, the sheath of the artery opened, and the vessel, after being separated from the median nerve, and two accompanying veins, tied with due firmness.

When aneurism of the brachial artery is diffused, and attended with violent pain and inflammation, Scarpa ‡ prefers the old operation of opening the tumour, taking out the coagulated blood, and tying the artery with two ligatures, one above, the other below, the opening of the vessel. The same practice is said to be necessary when the aneurism is very large. §

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* Haller, Fasc. Anat. Arteriæ Pelvis, Tab. 1, 2. z. b., and Scarpa in Memoria sulla Legatura delle Principali Arterie, &c. p. 116.

† Scarpa, p.117.

‡ Anatomy, Pathology, and Surgical Treatment of Aneurism, transl. by Wishart, p. 356.

§ Sir A. Cooper's Lectures, vol. ii. p.80.

AXILLARY ANEURISMS.

The sufficiency of the anastomosing vessels for the transmission of the blood, when a large arterial trunk is tied, appears now to have been exemplified in every situation, where the performance of such an operation is at all practicable. Not only may the external iliac artery be tied, without the circulation in the lower extremity being cut off, the subclavian artery may also be secured at the point where it first emerges from the chest, and yet the arm receive an adequate supply of blood.

In several operations, where the artery was tied through an incision below the clavicle, a large portion of the great pectoral muscle was divided; indeed, in the case of a wound, where it is necessary to apply a ligature both above and below the aperture in the vessel, such proceeding must sometimes be indispensable for the purpose of ascertaining the exact point of injury. But, in an aneurism not extending too far inward, the following less severe method is practicable, though more difficult of execution.

An incision two inches and a half long is to be made through the integuments, a little below the clavicle, and immediately over the hollow between the deltoid and pectoral muscles. The axillary vein here lies in front of the artery, and as a wound of it would probably be fatal, the utmost caution must be observed in the dissection. Care must also be taken not to mistake one of the cervical nerves for the artery. With an eye-probe, a ligature is to be put under the vessel, as soon as it is distinctly ascertained to be such, and the vein and any adjacent nerve should be carefully excluded.

Scarpa describes the method of operating below the clavicle as follows: the patient being seated with the shoulder somewhat depressed, an assistant standing behind is to hold him firmly in this position. The operator is to commence the incision in the integuments an inch from the sternal extremity of the clavicle, and to extend it along the lower edge of this bone towards the acromion, as far as the hollow between the pectoral and deltoid muscles. To the same extent he is then to detach the pectoral muscle from the clavicle, and reflect it a little, when the pectoralis minor will be found presenting itself, which, proceeding from the coracoid process, will be seen intersecting the lower, or external angle of the wound. The surgeon is now to insinuate the end of his finger between the point of the coracoid process, and the lower edge of the clavicle, where he will feel the exposed subclavian artery, surrounded by a part of the brachial plexus of nerves, and the subclavian vein in front of it. The artery having been separated from these parts is next to be tied.*

When the aneurismal tumour extends far inwards towards the sternum, the only place where the subclavian artery can be taken up, is just where it emerges from the chest, from behind the anterior scalenus muscle, and the object must be effected by cutting above the clavicle. On a dead subject, having no large aneurismal swelling, such an operation is much easier than on a living person, whose clavicle is sometimes pushed up by a vast tumour, so as to render the distance, between the artery and the wound in the skin considerable. However, in some cases, no difficulty of this kind was experienced; a fact, perhaps, to be imputed, either to the particular position and figure of the tumour; a natural difference in the distance between the clavicle and first rib in different individuals; and some variation made in the size and height of the wound, and parts cut, by different operators.* The common plan consists in making an incision about two inches and a half, or three inches in length, along the upper edge of the clavicle, beginning it a little above the clavicular portion of the sterno-cleido-mastoideus. The fibres of the platysma myoides are next to be carefully divided to the same extent, when several veins will generally present themselves, and, if they cannot be pushed aside, and should bleed much on being divided, ought to be tied at once, so that the blood may not obscure the rest of the requisite proceedings. The cervical fascia having been cautiously divided, the knife is to be laid aside; the cellular membrane and glands of the neck separated with the finger, or end of a director, and the eminence felt for at the junction of the bone with the cartilaginous part of the first rib, the point, where the vessel will be found coming out from behind the anterior scalenus muscle. The ligature is then to be conveyed under it with the aid of one of the needles hereafter described. Care must be taken not to mistake one of the cervical nerves for the artery, the pulsation of which communicates a corresponding motion to any of these nerves in its vicinity. Most of them, however, lie rather behind it, and more towards the shoulder.

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* Memoria sulla Legatura delle Principali Arterie, &c. p. 126. Pavia, 1817. A similar method of finding the subclavian artery was also described in Mr. C. Bell's Operative Surgery, vol. ii. p. 370. edit. 1.

This operation has now been done with complete success by Dr. Post, of New York, Mr. Liston, of Edinburgh, Dupuytren, and several other surgeons.

The judgment that I formed from the observation of the first instance, in which this operation was ever finished, was, that, in all probability, a complete cure would have taken place, had the attempt been made earlier, before the tumour began to slough, and before the health was materially impaired; and had the operation itself been shortened and facilitated by the assistance of the needles represented in Mr. Ramsden's publication.

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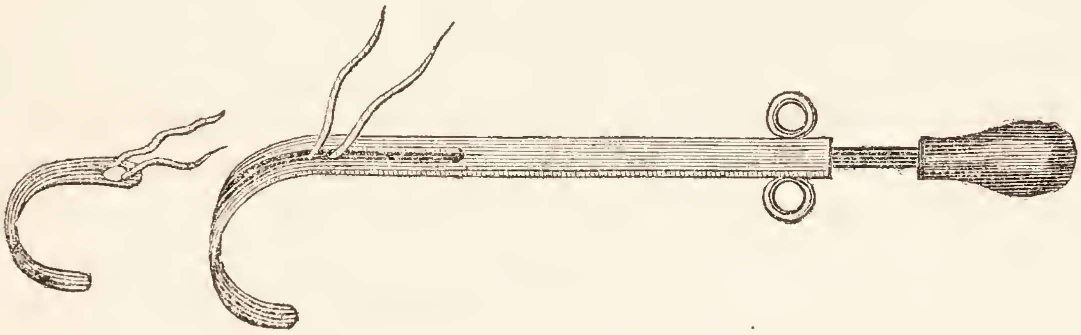
* In the first attempt which I saw made to take up the subclavian artery, it was very deep, and the surgeon tied one of the cervical nerves instead of it. In the next case which fell under my observation, the operation took up nearly an hour, on account of the difficulty of getting the ligature round the artery. Dr. Post, of New York, whose case is the first instance of recovery after the operation of tying the artery by cutting above the clavicle, found it necessary to use an instrument calculated to facilitate the conveyance of the ligature round the vessel. See Med.-Chir. Trans. vol. ix. p. 188. In one case, Sir A. Cooper was even prevented by this difficulty from completing the operation. See Lond. Med. Review, vol. ii. p. 300. On the other hand, Mr. T. Blizard, and some other surgeons in their particular examples, had no difficulty in applying the ligature with a common aneurism-needle. Hodgson, Op. cit. p. 598.

These instruments undoubtedly resemble, in principle, Desault's spring aneurism needle, which consisted of a silver sheath, one end of which was straight, and the other curved in a semi-circular way. This sheath enclosed an elastic wire, one end of which projected a little beyond the bent end of the sheath, and had a transverse eye in it, for the reception of the ligature. The instrument being introduced under the artery, the sheath was kept fixed, while the elastic wire was pushed through it, till the transverse eye had ascended sufficiently to let the surgeon take hold of the ligature. This being disengaged from the instrument, the latter was withdrawn.* The needle, invented by Mr. Watts, appears to me rather an improvement on Desault's, inasmuch as it is made to let loose the eye and ligature together, as soon as they are conveyed far enough round the artery; a contrivance which overcomes the difficulty of extricating the ligature.



The most ingenious contrivance, however, for passing a ligature under a deeply-seated artery, where the wound is narrow, is the needle made by Mr. Weiss, at the suggestion of Mr. Kirby, of Dublin. The following is a representation of it, reduced to one half of its proper size.†

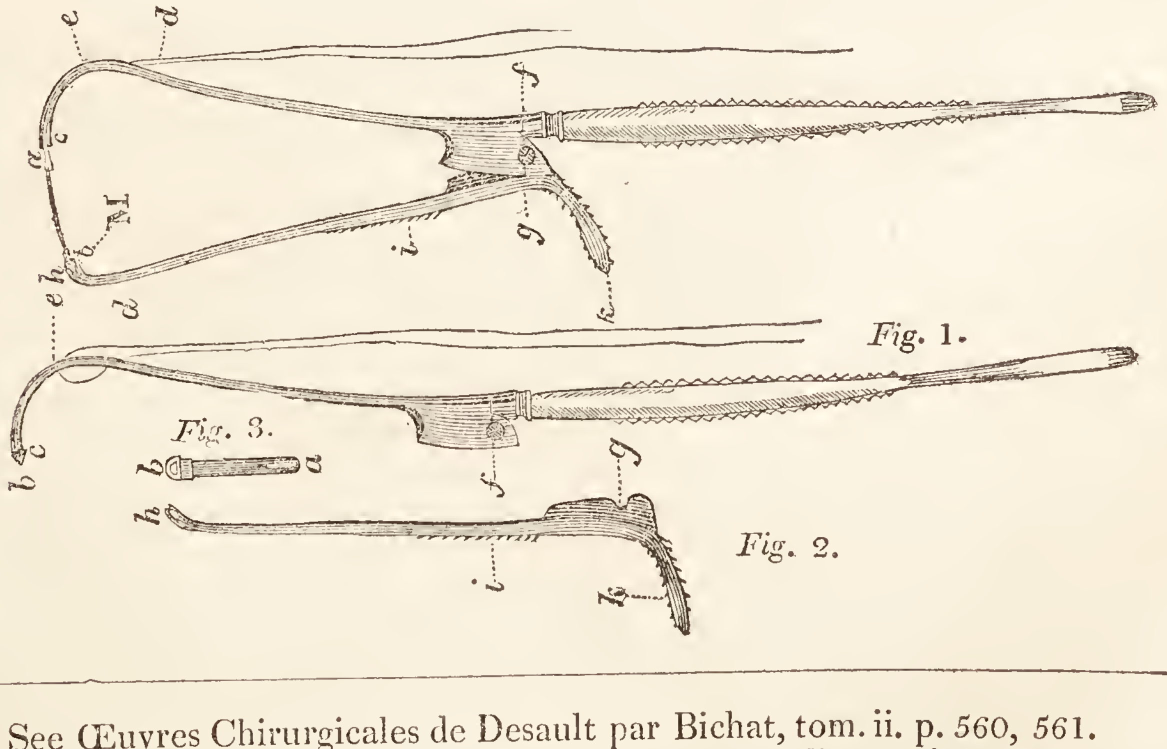


Fig. 1.

Fig. 3.

Fig. 2.

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* See Œuvres Chirurgicales de Desault par Bichat, tom. ii. p. 560, 561.

† It consists of three parts; the porte-aiguille, the disengaging forceps, and the needle. The needle, fig. 3. is short, flat, and elastic, with a wide eye, *a*, and a thick

CAROTID ANEURISM.

That the carotid artery might become gradually obliterated, without any dangerous effect on the brain, and that an aneurism of it might undergo a spontaneous cure, was long since proved by the case related by Petit.* But, besides this kind of obliteration by a process of nature, modern experience has evinced, that the carotid artery may be tied with a ligature, and thus rendered suddenly impervious, without any pernicious consequences on the brain. Hebenstreit mentions a case, where the external carotid was wounded in the extirpation of a tumour; and the patient would quickly have fallen a victim to the hemorrhage, had not the surgeon instantly tied the trunk of the artery. The patient lived many years * afterwards. After the battle of Waterloo, I assisted my friend Mr. Collier in taking up the carotid, for the purpose of suppressing a violent hemorrhage from a wound made with a lance, and extending from the angle of the jaw into the mouth. This operation had the most successful result.

Aneurism by anastomosis, situated in the orbit, antrum, and on other parts of the head, have been cured by the application of a ligature to the common carotid. The cases, recorded by Mr. Travers, Mr. Dalrymple, and Professor Pattison, of Baltimore, illustrating the success of this practice, are highly deserving of the notice of the profession. In a few instances, the carotid has been tied, for the purpose of lessening the hemorrhage, during the removal of large complicated swellings from the neck and side of the head.

The operation is performed by making an incision through the integuments of the neck, beginning just above the upper part of

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point, *b*, that also has an eye in it to be laid hold of with the forceps. The porte-aiguille, 1. is hollow from *c* to *e* for the reception of the needle, and has a slit in it from *e* to *d*, so that the extremity *a* of the needle, when it is in the case, is in the middle of the slit *e d*, and the eye can be threaded. Another essential part of the porte-aiguille is the transverse fulcrum at *f*, on which the notch *g* turns. The length of the forceps, 2., must be exactly such, that when the notch is on the fulcrum, the spring at the end, *h* is correctly applied to the point *b* of the needle in its case. When the instrument is to be prepared for use, the end of the needle, marked *a*, is to be put into the hole, marked *c*, at the end of the porte-aiguille, and pushed quite home. One end of the ligature is then to be put through the slit at *d*. from the outside of the needle, and the same end again from the inside through the eye of the needle, and the slit at *e*. The needle thus threaded, is to be introduced under the artery; and now the disengaging forceps, marked 2., is to be placed with its notch *g* on the screw, when by pressing on the rough part of the handle of the forceps, marked *i* the surgeon will make the point *h* catch hold of the eye *b* of the needle, to which the ligature is attached. Then, by taking hold of the part of the handle of the forceps, marked *k*. and pressing it downwards, he will draw out the spring, and the ligature with it. The best mode of clearing the ligature from the spring, is to cut the former away at both ends from the instrument. See Edinb. Med. Journ. No. 76.

* Acad. R. des Sciences de Paris, an. 1765.

† See his trans. of B. Bell's Surgery, vol. v.

the sternum and ascending for two inches, or a little more, by the side of the inner edge of the sterno-cleido-mastoideus. A wound of this length will be quite long enough to expose the sterno-hyoideus and sterno-thyroideus muscles. * The patient's chin being now turned towards the diseased side, in order to relax the sterno-cleido-mastoideus, while the sterno-hyoideus, and sterno-thyroideus are gently pressed towards the trachea, the large internal jugular vein presents itself. This vessel, on account of its magnitude, and its alternate expansion and subsidence with each inspiration and expiration might sometimes retard the operation, were it not pushed towards the outside of the neck. Immediately under the internal jugular vein, the common carotid appears. The operator is then cautiously to make a small opening, about a quarter of an inch long, in the sheath of cellular membrane, which includes the artery. He now separates this vessel from the par vagum, and introduces a ligature under it with an eye-probe, or aneurism-needle. Sometimes two ligatures have been used, and the vessel divided between them; but, I believe, little doubt is now entertained about the preference, which should be given to the employment of only one, excepting for a wound of the carotid, where two would be indispensable, or where a long portion of the vessel has been detached from its natural connexions.†

CHAP. XXX.

FRACTURES.

Fractures are of two principal kinds, namely *simple* and *compound*. A *simple* fracture is unattended with any external wound, caused by the protrusion of the end of the broken bone: a *compound* fracture is always accompanied with a wound of this description.

A fracture is often named *complicated*, when the bone is broken in more places than one, or is joined with dislocation, the injury of some considerable blood vessel or nerve, a gunshot-wound, &c.; and when the bone is crushed, or broken into many small pieces, the fracture is termed *comminuted*.

The expressions *longitudinal*, *transverse*, and *oblique* fractures, signifying their direction, with respect to the axis of the bone, are also frequent in the language of surgery.

The long cylindrical bones are more frequently broken than the short, or flat ones; a fact, explained by their shape, their uses, their situation, and the many powerful muscles attached to them. It is generally stated in surgical books, that the muscles are always concerned in the production of fractures; but this is far from being the case. We know, that they sometimes act with such force, that they break the patella, and even the humerus, without the co-operation of any external violence whatsoever. We know, that when a person is falling, their effort to save him is often surprisingly powerful, and may contribute, with the blow, or shock, to the production of the fracture. But, when a bone is broken by a direct blow, the muscles have no more share in causing the breach of continuity in the bone, than they ever have in occasioning a fracture of the cranium. In the advanced stages of cancer, particular constitutions, and old age, the bones are sometimes so brittle, that they are broken by very moderate degrees of external force, or even the ordinary exertion of the muscles, independently of all violence.

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* Scarpa, sull' Aneurism, tav. 5. 98.

† The cure of a carotid aneurism, by tying the artery above the swelling, when the ligature could not be applied below it, has been accomplished by Mr. Wardrop. See Med.-Chir. Trans. vol. xiii.

The symptoms of fractures are exceedingly diversified, according to the bones which are broken; and, though many writers set down loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis, it is easily comprehensible by any one acquainted with the structure of the body, that numerous fractures cannot prevent the motion of the part, nor produce any visible deformity. Thus, there may be a fracture, and yet, from the entangling of the fragments, or from a sound bone serving as a support to the broken one, no distortion can be perceived. Many cases are recorded, in which the patients, under these circumstances, were even capable of walking about, for some time after the accident.* Every surgeon also knows, that, though at first there may be pain in the situation of a fracture, no swelling and tension, excepting what may happen to arise from extravasation of blood, can take place till inflammation has had time to produce them.

More or less deformity, pain, swelling, and inability to move or use the limb, are also symptoms which may attend dislocations, and various diseases, so that they are never unequivocal proofs of the existence of a fracture.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace with the finger the outlines of the suspected bone, and, wherever any unusual pain occurs, or any unnatural irregularity appears, to try whether a grating, or *crepitus*, can be felt, on endeavouring to make one end of the bone rub against the other. When the os humeri, or os femoris, is the subject of injury, a crepitus is generally felt almost as soon as the limb is touched, and in the case of a broken thigh, there is mostly a considerable shortening of the extremity, caused by the action of such muscles as draw the leg and knee towards the pelvis. But, when there are two bones, as in the leg and fore-arm, and only one is broken, the other continues to prevent the limb from being shortened and thrown out of its natural shape, so that a crepitus can only be felt by a proper examination with the fingers. As I am aware, that considerable harm, and great unnecessary pain, have frequently been occasioned by the custom of feeling for a crepitus, and moving the limb about in all directions in order to produce it, let me observe, that the plan is only justifiable when the nature of the case cannot be sufficiently understood without it. A fracture is a case necessarily attended with considerable injury of the soft parts, and always followed by more or less inflammation, and its usual consequences, heat, tension, swelling, &c.; all unnecessary rough handling of the part, therefore, must be, above all things, contrary to the principles of good surgery.

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* See Gibson's Institutes, vol. i. p. 372., and Dorsey's Elements, vol. i. p. 113.

The displacement, or derangement of a fractured bone, may be either *angular*, *longitudinal*, *transverse*, or in the direction of its circumference, and very frequently more or less in all these directions together. The causes of the displacement always depend, either upon the force by which the accident was produced, upon the action of muscles, upon the weight of the body, or that of the limb itself.*

The muscles of a broken limb are often affected with spasms, which put the patient to great pain, and when the thigh-bone, humerus, or both bones of the leg or fore-arm are broken, sometimes occasion, during their violence, very considerable distortion of the member.

The prognosis depends very much upon the injury done at the same time to the soft parts; the patient's age and constitution; the direction of the fracture; and the particular bone broken. Oblique fractures of the long bones are more difficult to cure without deformity, than transverse ones. Compound, complicated, and comminuted fractures are the most dangerous. A fracture near, or affecting a large joint, frequently ends badly; but injuries of the patella, olecranon, and small joints, mostly have a favourable termination. A fracture of the neck of the thigh-bone, *within the capsular ligament*, perhaps, does not admit of a perfect cure, a bony union never taking place. Fractures of the patella, olecranon, condyles of the os humeri, and coronoid process of the ulna, also generally unite by means of a ligamentous substance. †

The steps of nature, in the union of broken bones, are very similar to those which she pursues in the union of wounds of the soft parts. The vessels on the surfaces of the fracture, and those of the periosteum, and soft parts directly adjoining the injury of the bone, first effuse coagulating lymph. This gradually becomes vascular, and as its vessels acquire the power of depositing earthy matter, it is ultimately converted into new bone, termed *callus*, which becomes the bond of union.

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* Gibson's Institutes, vol. i. p. 373.

† See A. Cooper on Dislocations, &c p. 112., edit. 4.

In order that the first connecting substance may speedily become organized, and adapted to the formation of callus, nothing is so favourable as perfect quietude. Hence, the chief surgical indication, after the ends of a fracture are replaced, is to keep them perfectly motionless: nature completes the rest. The accomplishment of a complete bony union, however, requires that each end of the fracture should be duly supplied with blood; and hence the reason may be understood why fractures of the neck of the thigh bone *entirely* within the capsular ligament, and some other cases, do not generally unite by bone. In the example here specified, the only channel for blood to the upper fragment, must be the small vessels of the ligamentum teres. The observations of Sir A. Cooper[*] likewise tend to prove, that if the end of a fracture be kept much asunder, or with such an interspace as occurs when the protruded end of the tibia is sawn off, and the fibula is whole, no bony union follows. Different bones require different lengths of time to be firmly united; the ribs and clavicle unite as soon as any; in general the os brachii is tolerably firm in five weeks; but, the bones of the leg and the os femoris seldom become perfectly strong in less than six. These calculations, however, refer to adults; for, in children, fractures are cured with much greater expedition; and, it is always found, that the quickness of union in all persons, is in proportion to the vascularity of the bone or bones concerned, the skill of the treatment, and the sound state of the constitution.

The three principal indications in the treatment are, to reduce the ends of the bone if displaced, to retain them in this position, and to administer such diet and medicines as the future symptoms and state of the patient may require.

In the language of surgery, the first indication is accomplished by extension, counter-extension, relaxation of the muscles, and coaptation, or the adjustment of the fragments.

The relaxation of such muscles, as have the power of displacing the ends of a fractured bone, always materially facilitates the reduction. The choice of an advantageous position, indeed, is the first thing in all cases, in which the extremities of the fracture are not in even contact. The muscles are the chief powers which cause the displacement, by drawing that end of the bone which is most moveable, out of its due position, in regard to that which is most fixed. Hence, in the extremities, the lower ends of fractures are those which are truly displaced, being drawn upward, or to one side, by the action of certain muscles, which have their origin and insertions both above and below the situation of the breach of continuity. The muscles, therefore, which displace the lower ends of such fractures, are the principal powers which must be counteracted. In oblique fractures, it is much more difficult to keep the ends of the bones in a proper state of coaptation, because two oblique surfaces make no mechanical resistance to that effect, (viz. the retraction of the lower portion of the broken bone,) which the strong muscles have a continual tendency to produce.

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[*] On Dislocations, p. 116.

But the relaxation of muscles, possessing the greatest influence over a fracture, is not only to be observed while the surgeon is setting the broken bone; it is to be strictly adopted throughout the whole of the treatment, at least, until the two ends of the bone have become firmly united. Were this plan not rigorously followed, the fracture would soon be displaced again by muscular action.

The principle, from which the utility of relaxing muscles in these cases arises, is the fact, that every muscle can only contract to a certain degree of shortness: and that in proportion as its origin and insertion are approximated, the disposition to spasmodic action diminishes.

The reflecting student may inquire, what particular position will relax every muscle connected with a broken bone? The same position, which relaxes the flexors, seems to have quite an opposite effect on the extensors. The answer is, that no posture will completely relax every set of muscles in every instance; and in this circumstance, the joints must be placed in the middle state, between perfect flexion and perfect extension, as in this manner, though complete relaxation is not effected, most of the muscles will not be in a state of tension. When, however, every muscle, having the power to displace a fracture, can be relaxed, the others, which have no power over the progress of the case, may be neglected and the posture determined accordingly. Thus, in common fractures of the leg, where we cannot perfectly relax every muscle capable of disturbing the fracture, we place the knee-joint in the mid-state, between perfect flexion and extension: but in a fracture of the patella, where we can relax every muscle capable of resisting the object of the surgeon, we regulate the posture, without any regard to other muscles, which have no influence over the fracture.

In cases of broken thighs, where the impossibility of relaxing every muscle that has the power of disturbing the fracture is strongly exemplified, it was the practice of Mr. Pott to select also a half-bent position of the hip and knee-joints, in which state he conceived that less trouble was experienced from the action of the muscles. It does not require, however, a powerful mass of muscular fibres to displace the fracture. Hence, though the half-bent posture may relax such muscles as have the greatest force, yet, if we leave a certain set of muscles unrelaxed, which, by their action, can draw the ends of the broken bone into a wrong position, I am afraid, posture alone is not the great object, to which every other consideration should be sacrificed. I am also the more persuaded of the truth of this remark from knowing, that no position, no approximation of the origin and insertion of a muscle, can altogether prevent those violent, involuntary spasms, which take place in cases of fractures. We must then turn our minds to the improvement of our mechanical means for holding the ends of the broken bone steadily and evenly together. In the case of a broken thigh, it is quite impossible to employ the bent position, as advised by Pott, which relaxes the most powerful and troublesome muscles, and, at the same time, use the best kinds of apparatus for keeping the ends of the fracture in a proper state of coaptation, and free from motion. In this accident, the whole limb ought to be kept motionless by mechanical means; for, if the knee be left unconfined, and the leg subject to frequent motion, as is actually the case in Pott's mode of treatment, how are we to expect that the fracture can remain undisturbed and undisplaced? However, when position of the limb, and relaxation of the most powerful muscles, can be made to concur with the best mechanical apparatus for securing the ends of a broken bone from being displaced, these are the principles, by which we should be governed. Hence, in the case of a broken thigh, the position of the limb on the double-inclined plane, with the patient lying on his back, and his leg and foot properly fixed on the machine, is greatly superior to Pott's method of treatment.

The positions for particular fractures, will be noticed in the second part of this work.

Having placed the ends of the fracture as evenly together as the case will allow, the next object is to keep them securely and quietly in this state, until they have become firmly united.

In certain constitutions, almost almost all the muscles of the injured limb are continually acting in a violent, involuntary, and spasmodic manner, so that neitheir position, nor mechanical means, are effectual in preventing displacement of the fracture. Patients, in this state, if young and robust, should be bled, and be kept under the influence of opium.

The mechanical contrivances, employed to give that degree of support to the limb, which the breach of continuity in the bone or bones has taken away, consist of instruments called splints, with which a kind of steady, unyielding case is formed for the limb. Splints ought to be made of strong materials, and of a sufficient length to reach beyond the two joints nearest the fracture, and they ought to be adapted in shape to the contour of the limb. They are generally secured with straps or tapes.

However, as the hardness of splints would give pain, if they were firmly applied to the limb, without the intervention of soft materials, it is customary to place a piece of the emplastrum saponis immediately over a simple fracture, and to apply, what is termed an eighteen-tailed bandage, between which latter and the splints are also interposed pads filled with tow, or any other soft substances. Additional soft compresses are also generally put at every point where the pressure of the splints is likely to give pain.

When there is much swelling, surgeons generally apply, for the first few days, cold water, with a little spirit of wine in it; the liquor ammon. acet., or the lotio liq. plumbi acetatis, instead of a plaster, and the linen, employed for this purpose, may be kept sufficiently wet, (without taking off the splints) by squeezing the water or lotion out of a sponge into the interspaces between them.

All violent extension for the reduction of fractures, is quite abandoned by the moderns. In general, when the muscles are relaxed in a scientific manner, the ends of the bone may be put into a state of coaptation with the greatest ease, and very little extension and counter-extension is necessary. Many fractures, indeed, are not in the least displaced.

Common fractures of the arm and fore-arm, in healthy subjects, are firmly united in about a month; while those of the thigh and leg require about six or seven weeks. When the union does not take place, after a reasonable length of time, the surgeon should endeavour to ascertain the cause. This may sometimes be imputed, either to the ends of the fracture not being in apposition; to the part having been moved and disturbed too much; to the advanced age of the patient; or to a general languor, or some idiosyncrasy of the constitution.

In the first and second of these cases, the bone should be set again, and kept quite motionless. When the patient is very old, the use of splints is to be continued longer than in other cases, and tonic medicines may be prescribed.

When several months elapse, without any union of the fracture, and there is reason to apprehend the formation of an artificial joint, surgical writers join Celsus in recommending the ends of the broken part to be firmly rubbed against each other, with the view of making them inflame and grow together. On the same principle, some surgeons have allowed their patients, with broken legs, or thighs, confined in splints, to get up and walk about. As soon as the necessary irritation is produced, the limb is to be kept motionless a sufficient length of time.*

If such plans fail, it has been proposed to cut down to the broken part, and rasp or saw off the ends of the bone, and then treat the case, like a recent compound fracture. The latter operation was first devised, and practised with success, by Mr. C. White, of Manchester, in an example, in which the humerus could not be united by ordinary methods; and scraping the fracture was successfully performed by the same gentleman for the cure of an old fracture of the tibia.†

I have seen the operation of sawing off the ends of a fractured humerus practised without success, in St. Bartholomew's Hospital. After one operation of this kind, done in France, the patient died on the sixth day.‡

On the other hand, Mr. White's cases are highly favourable to the practice. Mr. Rowlands, of Chester, and other surgeons, have likewise found the operation answer. The latter gentleman performed it on the thigh-bone, by cutting down to the fracture between the rectus and vastus externus muscles, and placing a strong plate of tin under the ends of the bone, when the saw was used. It was found necessary to make a transverse incision through a great part of the vastus, in order to facilitate the removal of the lower end of the fractured part; but, though Mr. Rowlands succeeded in his objects, the case was attended with such difficulties, that he expresses himself to be undecided concerning the propriety of advising the operation to be undertaken by others.*

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* See White's Cases in Surgery, p. 75.

† See Cases, pp. 69—79.

‡ Richerand's Nosographie Chir. t. iii. p. 39. edit. 2.

Dr. Physick's practice consists in making the ends of the bone inflame and suppurate by the introduction of a seton through the fracture, and then applying splints. He thus succeeded in consolidating a disunited humerus. This plan, which is considered milder and safer than turning out the ends of the fracture, and sawing them off, has been followed in London, with various degrees of success, by Mr. Brodie, Mr. C. Bell, Mr. Wardrop, &c.

COMPOUND FRACTURES.

A compound fracture is accompanied with a wound of the integuments, caused by a protrusion of the end of the broken bone.

When the wound is large and lacerated, when the bone or bones are extensively splintered, or shattered, and when the neighbouring muscles are severely injured, the case must be considered as extremely dangerous.

A limb, in this condition, submitted to the inspection of the discerning and scientific practitioner, presents to him one of those urgent cases, in which he sees at once the necessity for immediate amputation. The accident is an analogous injury to a bad gunshot wound of the limb, with fracture, and the observations which have been made respecting the frequent danger of delaying the amputation of limbs, shattered by gunshot violence, are in every respect applicable to these very bad compound fractures, occasioned by other causes.

So great and considerable an injury, inflicted upon parts endued with life and sensibility, capable of inflammation, suppuration, and gangrene, cannot be expected to take place, without being followed by the most severe effects, both upon the limb itself and the constitution. Supposing, however, the bone to be less badly broken, and the soft parts not quite so much bruised, wounded, and torn, and no large artery lacerated, the case is then of a very different description; and resorting to amputation, without an endeavour to save the limb, would be rash and unjustifiable. Instead of this, the fracture is to be immediately placed as nearly in its natural situation as circumstances will allow, and the wounded integuments brought nicely into contact by means of adhesive plaster, in order that the chances of union by the first intention may be taken. Under favourable circumstances of constitution, and proper antiphlogistic treatment, the subsequent local inflammation will not be too extensive and high, to prevent the much desired object of a quick and complete closure of the external wound by adhesion, and when this is the case, the sympathetic fever is always moderate in proportion.

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* See Medico-Chir. Trans. vol. ii. p. 47.

In all cases of compound fractures, in which an attempt is to be made to save the limb, the primary object to be aimed at, is to lessen the danger of the accident, by converting the injury, as speedily as possible, from the state of a compound into that of a simple fracture, by uniting the wound of the integuments. Sometimes the plan succeeds, and a very important step is gained. In some instances, only a partial union follows; while, in others, where the contusion and laceration of the soft parts are more severe, the attempt fails altogether.

When the local violence is followed by higher inflammation, when the wound does not unite by the first intention, and suppuration is the consequence, a considerable degree of sympathetic fever generally follows, and great powers of constitution are necessary to bear all the irritation consequent to the injury, and the long and copious discharge. Sometimes, in this state, the constitution, impaired and weakened by the local disease, is attacked by hectic symptoms; fresh irritation occurs about the fracture; large suppurations take place under the fascia, and require to be opened; and the patient is at length brought to the lowest condition of weakness, from which nothing can extricate him, but the removal of the limb, the result of which operation is also uncertain. At other times, the patient's constitution holding out, the suppuration is soon accompanied with the formation of granulations, and cicatrization follows.

Let us consider a third case, in which the violence done to the limb has been more severe, so as to be followed by a speedy mortification of the whole extremity, and death of the patient. Here, perhaps, had the limb been sacrificed, and amputation performed immediately after the receipt of the accident, the patient's life might have been preserved. But, as soon as the rapid symptoms of gangrene have made their appearance, amputation is generally too late; and though it may be a question, whether we ought not in some of these cases yet to amputate, on the principles explained in the chapter on mortification, the inferior chance of recovery, which the patient now has, is proved by manifold experience. Hence, the absolute necessity of determining *primâ facie* the propriety or impropriety of attempting to preserve a limb with a compound fracture. In cases of compound fractures, there are two points of time when the surgeon has it best in his power to decide, whether it is most advisable to try to preserve the limb, or to sacrifice it for the sake of the patient's life. The one is immediately after the occurrence of the accident, and before an inflammatory and gangrenous tendency in the limb has had time to form. The other is after the subsidence of the first inflammatory symptoms, consequent to the injury, when the constitution seems incapable of bearing any longer the great irritation and immense discharge from the wound, and when hectic fever is more likely to close the patient's existence, if a further perseverance in an attempt to save the limb be made, than that the object in view should be accomplished.

The treatment of a compound is similar to that of a simple fracture, only a more rigorous attention to quietude, diet, and the administration of proper medicines is necessary. The posture of the limb must generally be regulated by the same considerations as in the case of a simple fracture; the fracture, if displaced, must be reduced as speedily as possible; the limb must be laid upon a splint, long enough to hinder all motions of the two nearest joints, and having upon it a pad of tow or other soft materials, and an eighteen-tailed bandage. The wound must then be gently closed, so as to give it an opportunity of uniting by the first intention. When the wound suppurates, such dressings must be used as circumstances require, care being taken, that, at each application of them, the fracture be disturbed as little as possible. Exfoliations are common in these cases, and attention will be required to the extraction of every piece of bone as soon as it is loose.

Though in the early stage of compound fractures one might generally be induced to have recourse to phlebotomy, as one of the best means for preventing inflammation, it is found in London to be ultimately prejudicial, weakening the constitution too much, and incapacitating the patient to bear the long and copious discharge of matter which often ensues. It is also a commonly received opinion, that compound fractures go on so much better in the country than in this large metropolis, and patients bear so much better the rigorous employment of antiphlogistic measures, that it is right to attempt the preservation of numerous limbs out of town, which in London would require amputation.

In all bad fractures of the lower extremity, it is a matter of great importance to place the patient upon a bed constructed on the principles of that invented by Mr. Earle, by which means any posture of the whole body or limb, deemed advantageous, may be conveniently maintained, and, what is of equal consequence, the bowels emptied, without the least disturbance of the fracture.

CHAP. XXXI.

DISLOCATIONS.

When the head, or articular surface of a bone is thrown out of its proper place, with respect to the corresponding articular cavity, or surface of another bone, in or upon which it is naturally situated, the accident is termed a *dislocation*, or *luxation*.

Dislocations are divided, like fractures, into two principal kinds; viz. *simple* and *compound:* simple, when there is no external wound penetrating the capsular ligament, and communicating with the cavity of the joint; compound, when the injury is attended with a wound of this description. Dislocations have also been divided into *ancient* and *recent; complete* and *incomplete; primitive* and *consecutive.*

Such joints as admit of extensive and various motions, are generally the most liable to dislocations; for instance, the shoulder, which is dislocated more frequently than any other joint. In those of the ginglymoid kind, which move only in two directions, luxations happen much less frequently, and, for the most part, are incomplete; that is to say, the articular surfaces, though displaced, are not wholly separated, owing to their great breadth, their mutually corresponding eminences and depressions, and the number and strength of the ligaments by which they are bound together. If we put out of consideration partial dislocations of the astragalus from the os naviculare, we scarcely ever meet with *incomplete* luxations, except in ginglymoid joints, like the ankle, the knee, and the elbow.

Thus, a case is related by Sir Astley Cooper, in which the end of the tibia rested in part upon the astragalus, but a larger portion of it on the os naviculare. *

The distinctions *primitive* and *consecutive*, much adopted by Desault, are highly necessary in considering the nature of dislocations; for, the practitioner should understand well, that after the head of a bone has slipped out of the articular cavity, its situation may be materially altered by the action of the muscles. When it remains in the place into which it was originally forced, the luxation is called *primitive*; *consecutive* when it has been drawn by the muscles out of the situation into which it was first thrown.

The diagnostic marks of dislocations chiefly consist of circumstances, arising from the functions of the affected joint being interrupted; and the lodgment of the head of the bone in an unnatural situation, and among parts which it compresses and renders painful. Hence, there is a diminution or loss of motion in the joint; the limb or part is either shortened, lengthened, or distorted to one side, according to the kind of dislocation; its axis is changed; the shape of the joint is altered; the natural prominences of bone either disappear or become less conspicuous, as the trochanter at the hip; or the reverse may occur, as in dislocations of the shoulder, where the acromion projects more than usual. † In many cases, the head of the bone may be plainly felt in its new situation, and the nature of the accident readily detected by rotating the limb, as the head of the bone then also rotates. ‡ The pressure of the head of the bone on the surrounding parts causes great pain, which is immensely increased when the surgeon moves the limb in order to examine the case, extreme agony, and an obstinate and even incurable paralysis being induced, when a large nerve is thus compressed and injured. Nay, the pressure of the head of a dislocated bone upon important organs may endanger life; and Sir A. Cooper has recorded one instance, where such danger arose from the pressure of the sternal end of the clavicle upon the œsophagus. In thin subjects, before inflammation and swelling have had time to come on, the head of the dislocated bone may sometimes be distinctly felt, forming a preternatural tumour or projection, while, in the situation of the articular cavity, there is an unusual depression, or want of fulness. A considerable degree of mobility sometimes continues for a short time. A man dislocated the head of the thigh-bone upon the obturator foramen; the thigh could at first be moved about with freedom; but, in less than three hours, the head of the bone became firmly fixed in its new situation by the contraction of the muscles. *

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* On Dislocations, &c. p. 17. ed. 4.

† Surgical Essays, part i. p. 4. 8vo. London, 1818.

‡ See Sir A. Cooper on Dislocations, p. 5. ed. 4.

A good deal of swelling generally follows a dislocation, and this sometimes very quickly, especially, when the violence has been considerable, and blood is extravasated. However, in simple dislocations, which have been reduced, the ensuing inflammation rarely ends in suppuration; though two fatal instances of it, after the reduction of a dislocated hip, are mentioned by Sir A. Cooper.

Dislocations may be accompanied with fracture: in those of the ankle, the fibula is mostly broken; at the hip, the acetabulum may be fractured; and in the elbow, the coronoid process of the ulna sometimes suffers.

Luxations are mostly produced by external violence, by which such ligaments are torn as naturally keep the dislocated heads of the bones from being thrown into the particular directions in which, in the various cases, they are found to be situated. Even tendons, in the vicinity of the joints, are frequently lacerated. According to Sir A. Cooper, the capsular ligament is torn to a great extent transversely; in the hip, the ligamentum teres is ruptured; but, in the shoulder, he never found the tendon of the biceps broken. He describes the tendons which cover the ligaments, as being also torn, particularly the tendon of the subscapularis muscle, when the head of the humerus is thrown into the axilla. Some of the muscles are much shortened, while others are upon the stretch, as is the case with the psoas and iliacus internus in dislocations of the thigh-bone downwards. A considerable laceration of muscles now and then occurs, as of the pectineus and adductor brevis, in the latter kind of luxation. †

In the ginglymoid articulations, external violence alone commonly produces luxations, which are frequently incomplete. But, in the orbicular joints, the action of the muscles has a share in occasioning

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* Op. cit. p. 3.

† A. Cooper in Surgical Essays, pp. 5. and 6.; also on Dislocations, &c. p. 7. ed. 4.

the accident, which is almost always complete. A dislocation of the lower jaw is caused entirely by the action of the muscles, and rarely by mechanical force.

The predisposing causes of dislocations are either natural, or accidental. The natural are; the joint admitting of great latitude of motion; the small extent of surfaces, by which the bones touch each other; the laxity * and small number of the ligaments uniting them; the shallowness of the articular cavity, &c. The accidental predisposing causes are, paralysis of such muscles as tend to strengthen the joint; a looseness of the ligaments from disease; and the circumstance of the bone having been dislocated on one or more previous occasions; a state, that has a remarkable effect in facilitating the displacement in luxations of the shoulder, patella, lower jaw, and thumb. Boyer mentions a case, where the deltoid muscle being paralytic, the mere weight of the arm dislocated the humerus from the scapula; and the same writer adverts to a woman, who could not yawn even moderately, without her jaw being luxated, in consequence of a looseness of the ligaments. † If muscles are kept extended for a long time, and their tone is destroyed, or if from a paralytic affection, they lose their action, the bone to which they are attached may be easily dislocated, and as easily replaced. ‡ Dislocations are less frequent in very young and elderly persons, than in those of middle age; because, in old subjects, the ends of the bones are so softened, that the force applied often breaks them; and, in children, the bones more commonly break, or the epiphyses give way. § I have attended, however, several cases of dislocation in young children; and an instance last year (1825) in one of Dr. Good's grand-daughters, whose ulna was dislocated backward at the elbow, though she could not be more than six years of age.

In luxations, the degree of danger is very much altered by the case being simple or compound. Simple dislocations, when recent, may commonly be reduced with facility, and cannot generally be reckoned dangerous. On the other hand, compound dislocations of large joints, like compound fractures, are frequently attended with considerable danger; and the same nicety of judgment is requisite in determining whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in these latter cases. Hence, most of the remarks, delivered on this point with respect to compound fractures, are here quite applicable. The degree of violence and laceration done to the soft parts, the great or little chance of healing the wound by the first intention,

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* A young girl brought up to tumbling, who went to consult Sir A. Cooper, used to have the patella laid flat upon the side of the external condyle of the femur, by the action of the rectus muscle, in consequence of the lax state of the ligaments.

† See Boyer's Lectures on the Bones, by Richerand, transl. by Farrell, vol. ii. pp. 58, 59.

‡ A. Cooper's Surgical Essays, p. 10

§ See A. Cooper, on Dislocations, p. 19.

the patient's state of health, and his youth or advanced age, are circumstances, by which the judgment should be guided in this difficult part of surgery. In the country, it is said, many cases recover, which in large cities would require amputation.

Dislocations of orbicular, are reckoned less dangerous, than those of ginglymoid joints. In the former, the action of the muscles has a great share in producing the accident, and the soft parts are generally less injured. But, even in joints of the same kind, the extent of the evil is measured by the largeness of the articular surfaces, and the number and strength of the muscles and ligaments. Hence, luxations of the elbow and wrist are generally less hazardous than those of the knee and ankle, the production of which requires the operation of greater violence.

Though luxations of orbicular joints are generally not so dangerous as those of ginglymoid articulations, they are more difficult to reduce, because the muscles, resisting the aim of the surgeon, are more numerous and powerful.

The indications, in the treatment of dislocations, are, to reduce the displaced articular surfaces as speedily as possible, and to support the joint with bandages, or splints, until the lacerated ligaments, tendons, &c. have had an opportunity of uniting; proper means being taken to subdue inflammation, and to prevent as much as possible the incurable stiffness that would arise from an exclusive regard to the second indication.

In some joints, the form of the bone may produce an impediment to the reduction: thus, when the socket is surrounded by a ridge, as the acetabulum is, the head of the bone is stopped by it, and requires to be lifted over it. When the head of a bone is larger than its cervix, as is the case with the upper head of the radius, some trouble is experienced.*

The chief difficulty, however, in the reduction of dislocations, arises from the resistance which the muscles make, and which increases in proportion to the length of time the bone remains unreduced. In some cases, this seems to depend in a great measure upon the permanent shortening of the muscles, which will not readily admit of being extended again to their usual length. When a bone is dislocated, the muscles draw it as far from the joint as the surrounding parts will allow, and by their contraction fix it there. The business of the surgeon is to counteract this resistance. If extension be made immediately after the accident, the resistance of the muscles is easily overcome; but, if the operation be deferred only a few days, the utmost difficulty is experienced. That the action of the muscles forms the principal impediment to reduction, is proved, first, by the facility of putting the bone into its right place in cases where the muscles are paralytic; secondly, by the same facility which occurs when the patient happens to be debilitated by intoxication, or faintness. Thus, Sir A. Cooper mentions a case of injury of the jejunum, and dislocation of the hip, where the muscles scarcely made any opposition to the reduction. Another fact, proving the power of the muscles in making resistance is the ease, with which a luxation may often be reduced when the surgeon suddenly makes the attempt when the patient's mind is directed to another subject, and the muscles are therefore unprepared for resistance.

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* A. Cooper, on Dislocations, &c. p. 20.

These facts furnish useful suggestions in practice, teaching us not only how to avail ourselves of any accidental swooning, or syncope, to replace the bones, but also how to adopt means for the express purpose of inducing faintness, great momentary debility, and universal muscular relaxation. These means are bleeding from a large orifice, nauseating doses of tartarised antimony *, the warm bath, opium, &c. with the aid of which dislocations may be reduced at a later period, than could otherwise be accomplished. † In strong, athletic subjects, the utility of such practice is daily seen; and if there remained any doubt about it, the manner in which it has been lately recommended by Sir A. Cooper ought to produce conviction. In fact, the cases published by him, completely prove, that when this method is neglected, the most powerful mechanical means sometimes fail. One excellent principle in the employment of mechanical force is to begin with it gently, continue it unremittingly, and increase it very gradually. The propriety of attending to this principle depends upon the fact, that the muscles are more certainly overcome by long-continued, gradual extension, than by short, interrupted, numerously repeated exertions of great sudden violence. When the muscles are opposed in this last injudicious manner, it requires an immense time to fatigue them effectually, and the sudden violence is more likely to tear the flesh, than reduce the bone.

In reducing dislocations, counter-extension is to be made; that is to say, the bone, with which the luxated one is naturally articulated is to be fixed, and kept back while the extension is practised. The necessity of fixing the scapula and clavicle in dislocations of the humerus, and the pelvis in luxations at the hip, is too obvious to require any comment. In making counter-extension, however, one essential caution is requisite; viz. never to make pressure exactly on the articular cavity, or any point between it and the head of the bone, as thus a great obstacle to the reduction would be created.

The extending force may be made either with towels, sheets, &c. put round the limb, and pulled by a sufficient number of assistants, or with what is better, multiplied pulleys, which, indeed, in cases of difficulty, are indispensable. The French (as I think) rightly prefer applying the extending force as far as they can from the luxated head of the bone; but, in this country, the plan of ap-

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* A. Cooper, Surgical Essays, p. 22.

† A. Cooper on Dislocations, p. 26.

plying the towels, pulleys, &c. to the lower end of the dislocated bone itself is mostly practised. In luxations of the hip, Sir A. Cooper applies the extension just above the condyles of the femur; in dislocations of the shoulder, however, he makes extension at the wrist, placing the heel in the axilla, and drawing the limb in a line with the side of the body; in which position, the pectoral and latissimus dorsi muscles are relaxed.*

In the reduction, it is always necessary to consider what muscles have the power of opposing the attempt, and if possible, they should be relaxed when the extension is made.

The return of the head of the bone into its right place is indicated by a snap heard at the instant of its slipping into the socket; by the restoration of the proper shape of the joint; and by that of its original motion.

The position in which the limb ought to be placed, and kept quiet, until the ligaments have united, must generally be determined on the same principles as in cases of fractures; and sometimes by a knowledge of those positions, in which the part can never be luxated. Thus, the hip can never be dislocated, while the knees are confined together; nor the jaw, while the mouth is shut: hence, the usefulness of bandages, which maintain these positions. In general, however, the reduced bone may be more easily kept in its proper situation, than a bone that is fractured. Some trouble, however, is occasionally experienced, when the bone has been repeatedly out of its place, and the muscles are paralytic, or the ligaments preternaturally loose.

The modes of reducing particular luxations will be noticed in the second part of this work.

In compound dislocations, it is a most important point to obtain a prompt union of the wound, as the injury is thus at once converted into a simple case. Therefore, as soon as the bones are reduced, the lips of the wound are to be accurately brought together with sticking plaster, and the joint kept perfectly quiet in splints.

In compound dislocations of the ankle, it appears to me generally bad practice to saw off the protruded end of the bone. Mr. Gooch was inclined to think favourably of the plan, when the head of the bone had been long exposed to the air.† But no surgeons, of the present day, ever delay the reduction until the bone has been materially affected by exposure. An eminent surgeon in London, who sometimes follows the practice, assigns as a reason for it the avoidance of tetanus; but this ground cannot be sufficient, because, though the method was never adopted in St. Bartholomew's Hospital, during the many years that I attended it, tetanus was a very rare occurrence there after compound dislocations. It is admitted, however, that if the dislocation can be easily reduced without the use of the saw; if the end of the bone be not so obliquely broken, that it will not remain firmly on the astragalus; if it be not shattered, and the patient so irritable, that the muscles are thrown into violent spasms by the attempts at reduction; the bones ought to be at once returned into their places.* The late Mr. Hey also sometimes sawed off the end of the bone; but, the only instance of the practice published by him, is strongly against it, the patient, after the cure, being able to walk but slowly and weakly, with his toes turned outwards.† This gentleman's use of sutures is also to be condemned.

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* Surgical Essays, vol. i. p. 25.; also on Dislocations, &c. p. 28. ed. 4.

† Cases in Surgery, p. 103. edit. 1.

Old luxations can hardly ever be reduced; for, not only the muscles become permanently shortened, and the articular cavity more or less obliterated, but the head of the dislocated bone acquires adhesions to the parts in its new situation, and is sometimes confined by a new bony socket, which must be broken, ere it could change its situation again. Sir A. Cooper considers all attempts to reduce the shoulder, after it has been out three months, imprudent, on account of the injury likely to result from the force employed. The endeavour to reduce the hip he does not recommend after eight weeks. These rules, however, he does not apply to persons of relaxed fibre, or advanced age.‡

Though dislocations are commonly occasioned by external force, they are, now and then, the consequence of disease in the joints. Every surgeon knows, that a luxation of the thigh-bone is often caused, in disease of the hip, by the destruction of the acetabulum, and articular ligaments. Sometimes the ligaments become greatly relaxed after an accumulation of synovia in the joints. When the knee-joint has been distended with such fluid, the patella is sometimes dislocated by the common efforts of the muscles in walking, as soon as the redundant secretion is absorbed.§ We do not often see a dislocation take place in white swellings of the knee; but it may occur. Mr. Lawrence informed me of a child, whose bones of the leg were drawn considerably upwards towards the tuberosity of the ischium, in consequence of disease in the knee; and since this observation was communicated to me, I have met with two or three examples of the same kind. In the museum of St. Thomas's Hospital is a preparation, in which a knee is dislocated in consequence of the destruction of the ligaments by ulceration: the bones of the leg are anchylosed at right angles with the femur, and turned directly forwards.‖

I once saw, with the above gentleman and Mr. Langstaff, a person afflicted with a diseased knee, whose leg could be bent to a very great extent towards each side, and this even when the limb was brought completely forward.

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* Sir A. Cooper, on Dislocations, p. 281 ed. 4.

† Pract. Observations in Surgery, p. 375. edit. 2.

‡ Surgical Essays, vol. i. p. 21., and Treatise, &c. p. 50

§ See Sir A. Cooper, in Surgical Essays, p. 9.

‖ Op. cit. p. 11.

The pressure of the dislocated head of a bone sometimes gives rise to œdema and paralysis of the limb. Desault met with several dislocations of the shoulder, in which a palsy of the arm was occasioned by injury of the axillary plexus of nerves. Some of these paralytic affections proved incurable; others yielded to the application of the moxa above the clavicle, or to the employment of strong ammoniacal liniments. *

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* See Œuvres Chir. de Desault; tom. i. p. 356—357.

END OF THE FIRST PART.

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY.

PART II.

PARTICULAR SURGICAL SUBJECTS.

CHAP. I.

INJURIES OF THE HEAD,

May be divided into superficial injuries; fractures of the cranium; pressure on the brain from extravasation; pressure on the brain from matter; concussion; phrenitis; the operation of trepanning.

SUPERFICIAL INJURIES.

Contusions of the scalp sometimes occasion abcesses under the aponeurosis of the occipito-frontalis muscle. The matter ought to be discharged as soon as its presence is ascertained; and, if possible, the opening should be made in a depending situation. The same kind of violence may produce an extravasation of blood beneath the same aponeurosis, attended with a tumour, which communicates to the fingers a sensation, so like that of a fracture, with depression of the cranium, as may be easily mistaken. The effused blood, however, is soon absorbed when mild purgatives, and the lotion of vinegar and muriate of ammonia, are duly employed.

Cuts of the integuments of the head, without injury of the skull, are simple wounds, unattended with any peculiarity, and generally admitting of direct union. Many contused and lacerated wounds of the scalp may also be united. The flaps, angles, and detached portions of these wounds, provided they are connected with the rest of the scalp at some point or another, ought never to be removed so as to cause an unnecessary exposure of the cranium; on the contrary, they ought to be carefully laid down, and, when not too severely contused, they will be found to live and unite to the surrounding parts.

No wounds are more liable to be followed by erysipelas than those of the head; a circumstance explained by Pétit, Desault, and Bichat, by the supposition, that they often disorder the hepatic functions, and thus produce a state of the constitution favourable to its occurrence. It is on the same principle, that these celebrated men, as well as Baron Larrey *, account for the frequency of abscesses in the livers of persons who die after injuries of the head; a thing which Richerand refers to the liver itself generally having suffered a concussion or mechanical injury at the same as time as the brain.† But, whatever may be the cause, the facts remain incontestible, that the head is particularly liable to erysipelas from wounds, and that disorder of the liver, and even abscesses in this organ, are occasional complications of injuries of the head. When a tumour is removed from the scalp, however skilfully the operation be done, a severe attack of erysipelas, sometimes ending fatally, will sometimes follow.

Erysipelas, in cases of wounds of the scalp, has been erroneously imputed to an injury of the aponeurosis of the occipito-frontalis muscle and pericranium; and extensive incisions, down to the skull, have been advised, for the purpose of removing the supposed tension of that tendinous expansion. It would be presumption to say, that there never is a case which may be thus benefitted: but, I am of opinion, that the practice has been too extensively recommended, the affection being mostly on the outside of the fascia. The best treament, as far as I have observed, consists in prescribing small doses of tartarized antimony, the blue pill, mild purgatives, and a low regimen.

FRACTURES OF THE CRANIUM.

When the breach of continuity in the bone is very fine, it is termed a *fissure;* when wide and open, it is named a *fracture.* When it happens at some distance from the spot on which the external violence has immediately operated, it is denominated a *counter-fissure.* The skull, at the fractured part, either continues on a level with the rest of the cranium, or it is depressed. The inner table is sometimes broken, while the external one remains entire.

Fractures of the cranium are in themselves by no means dangerous; that is to say, the simple breach of continuity in the bone, were it unaccompanied with other mischief, would rarely give rise to any serious complaints. In fact, fractures of the skull often get well without any bad symptoms whatever. The alarming symptoms, which frequently originate, are occasioned, either by the bone being beaten inward, so as to press upon or even wound the brain; or by the sharp irregular edges of the fracture irritating the dura mater, and making it inflame and suppurate; or else by mischief done to the parts within the cranium by the same force which broke the bone itself.

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* Mém. de Chir. Militaire. t. iv. p. 215.

† Nosographie Chir. t. ii. p. 245. edit. 4. 1815.

A fracture of the cranium, without depression, is not only itself unproductive of any dangerous effects, it is also unattended with any particular symptoms.* Its existence can only be ascertained by the eye or the touch, and therefore its diagnosis is not easy, unless it be exposed. However, a surgeon need not be solicitous to find out an undepressed fracture; nor is he warranted in making an useless incision merely to see the crack; for, if symptoms demand the application of the trephine, he is to apply it to the bone, whether it be fractured or not; and, if they do not require the operation, the fracture itself can never be a reason for the practice.

Bleedings from the nose, mouth, and ears, are no signs of a fracture of the cranium. The only inference from them is, that the force applied to the head has been violent; and even this conclusion is not a certain one; for, some persons have hemorrhages of this sort from very slight causes. Vertigo, paralysis, vomiting, loss of sense, &c. so often attending these cases, denote injury of the brain, and not a fracture of the skull.

Though a mere breach in the skull itself is not a source of danger, yet, considered as a symptom, it is of the highest importance; for, it shows that considerable violence has been applied; and, consequently, that the brain may have been injured. The effects on the parts within the skull, however, are not caused by the fracture, but by the same force which produced the breach of continuity in the bone.

Although the internal mischief is mostly situated beneath the place where the external violence has operated with most force, that is, beneath the fracture, yet it not unfrequently lies in a remote part. The same violence which breaks the cranium, may occasion a concussion of the brain, extravasation of blood in, or upon it, and a subsequent inflammation of it.

Even fractures, with considerable depression, are sometimes unattended with urgent symptoms; and, in this circumstance, the trephine is quite unnecessary; for, the only sound reason which can ever be given for its use, is the removal of such pressure from the brain as gives rise to *existing* symptoms of a dangerous tendency.

But whenever these symptoms do accompany a depressed fracture, the sooner the bone is elevated the better. Sometimes the inner table is depressed, so as to wound the dura mater and brain, and cause perilous symptoms, while the outer table is not even broken, nor thrown out of its natural level. On the 19th of June, 1815, I trephined a soldier for such an injury, which he had received at Waterloo. He was lying quite senseless, with stertorous respiration, dilated pupils, &c. On dividing the scalp, he betrayed no signs of sensation; but no sooner had the depressed portion of bone been removed than he raised himself up, looked round, and began to answer every question put to him.

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* In Klein's Chirurgische Bemerkungen, p. 161., we find a remarkable proof of the truth of this observation: a man's skull was so badly broken, that after death, the left half of it could with very little trouble, have been separated from the right; yet after the patient had recovered from the first stunning, which lasted an hour, he remained four-and-twenty hours absolutely without any bad symptom.

The only treatment, which a fracture of the skull necessarily requires, consists in taking measures to prevent inflammation of the brain, which is sometimes caused by the mechanical irritation of the fracture, but, in most instances, by the same violence which broke the bone itself. If we could ascertain, that the inequalities or pressure of the fracture caused the bad symptoms, we should be warranted in removing the fractured part with a trephine; but all that we can rationally do in common cases, is to apply cold washes to the part, bleed the patient freely and repeatedly from the temporal artery and arm, and prescribe antimonials, saline purgative medicines, and a low diet. The antiphlogistic regimen should be continued at least a month; for it is by no means uncommon for inflammation and abscesses of the brain to follow injuries of the head, a very considerable time after the patients have had reason to suppose themselves in perfect safety.*

PRESSURE ON THE BRAIN FROM EXTRAVASATION.

External violence, applied to the head, frequently occasions a rupture of the spinous, or some other artery of the dura mater; and a large quantity of blood is effused on the surface of this membrane. In many instances, the blood is extravasated between the dura and pia mater, or in the very substance, or cavities of the brain. Extravasations between the dura mater and any part of the base of the skull are mostly fatal.† When the blood lies between the dura mater and tunica arachnoides, or in the convolutions of the brain, it is in general widely diffused; but, when it is situated in the ventricles, or substance of the brain, it is always circumscribed.*

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* Some very interesting cases, illustrating this fact, are contained in Klein's Chirurgische Bemerkungen, 12mo. Stutgart, 1801, p. 113, &c. In some of these examples, the patients remained well and sensible more than a month, and were then seized with fever, shivering, convulsions, paralysis, &c. which soon destroyed them. What is curious, it was sometimes found, that though the symptoms began thus late, and perhaps proved fatal in two or three days, a large portion of the brain and its membranes was inundated with matter, abscesses formed in its substance; parts of it destroyed; its membranes considerably thickened; and even the cranium broken. We must here suppose, either that such disease was going on for a time, without producing any particular bad symptoms, or that its progress was most rapid after it had once begun.

† Œuvres de Desault par Bichat, tom. ii. p. 24.

In cases of extravasation, the patient is usually stunned by a blow, from which state he sometimes soon recovers; while, in other instances, he remains stupid and senseless. When he regains his senses soon after the first effects of the violence have subsided, and afterwards gradually relapses into a drowsy condition, and then into a state which I am about to describe, considerable light is thrown upon the case by there having been an interval of sense. That the following symptoms cannot arise from the concussion, is proved by the patient having recovered his senses, which he at first lost by being stunned; that the symptoms cannot be imputed to a depression of any part of the skull, is clear, because the patient would have continued senseless from the first; that the same symptoms cannot be attributed to matter beneath the skull is certain, because the time would not have been sufficient for the formation of matter, and there have been no symptoms of inflammation of the dura mater. Here any reflecting man must know, that hemorrhage within the skull has taken place, and that, in proportion as the quantity of effused blood increased after the accident, it induced the bad symptoms under which the patient labours.

Unfortunately, much obscurity is frequently occasioned by the effects of extravasation taking place before those of concussion subside, in which case, no interval of sense occurs, and we know not whether to ascribe the general insensibility to the former or the latter cause. But the worst cases of all are those, in which concussion and extravasation are co-existent.

When the quantity of blood is at first small, drowsiness and head-ach may be the only symptoms. When, however, the pressure on the brain increases with the increasing extravasation, the patient is gradually deprived of all sensibility. His eyes remain half open; his pupils are dilated; the iris does not move, even when a candle is brought near the eye; there is no sickness, which would betray sensibility in the stomach and œsophagus; the pulse is generally slow; the feces and urine pass involuntarily; and respiration is carried on with difficulty, and with a stertorous noise.

These symptoms indicate, with tolerable certainty, both extravasation and dangerous pressure on the brain; but the surgeon has few or no means of judging with precision where the effused blood is situated, nor of course where he should perforate the cranium with the trephine. He neither knows whether the blood lies immediately under the skull, upon the outer surface of the dura mater; between the dura mater and tunica arachnoides; in the convolutions; in the ventricles; or deeply in the substance of the brain. Supposing it to lie upon the dura mater, he knows not the exact point of its situation.

The common rule, in these cases, is to apply the trephine to the place where any traces of external violence appear, the extravasation being often situated under that part of the skull which received the blow. Should an appearance of contusion be manifest on the scalp, after the head has been shaved and carefully examined; should the scalp be wounded; or lastly, should there be a visible fracture of the cranium; the perforation is to be made in the situation of these injuries. The practitioner, however, has often the mortification to find, that the extravasation is not under the part of the skull, which has been perforated. In this dilemma, if the dura mater should appear prominent at the opening, as if blood were under it, some surgeons advise a puncture to be cautiously made in it. This practice might indeed sometimes let out a small quantity of serum; but as blood, in this situation, is always widely diffused, an effectual discharge of it is impracticable. As for extravasations more deeply situated, the uncertainty of their exact place must generally prohibit a prudent surgeon from meddling with them.

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* Op. cit. p. 25.

Paralysis is a symptom of pressure of the brain; when it affects one side of the body more than the other, and one pupil seems more dilated than its fellow, the extravasation is mostly on that side on which there is least paralysis, and least dilatation of the pupil. Sometimes, however, through the paralysis affects only parts of one side of the body, the extravasation is diffused, and not restricted to the opposite side of the brain.

When blood lay on the dura mater, Mr. Abernethy found, that the bone above it would not bleed when scraped: a remark well deserving recollection.

Desault, in the enumeration of his reasons for renouncing the trephine, notices the possibility of extravasation happening without any dangerous symptoms. Here, however, no surgeon would trephine, because the bad symptoms are the only true reason for the operation; nor without them would the extravasation be even suspected. With regard to the uncertainty of the diagnosis, I believe Desault was incorrect in denying the possibility of distinguishing the difference between the symptoms of extravasation and those of concussion, phrenitis, &c. Such discrimination has certainly been made with considerable success by Mr. Abernethy *; and some of the symptoms, characteristic of the several cases, as related in this publication, will not be likely to be confounded. †

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* Surgical Works, vol. ii.

† Klein relates a case which furnishes a useful caution: a litte girl, five years old, fell out of a carriage, pitched upon her head, and the hinder wheel passed over her right side. She got up directly afterwards, with a considerable wound of the forepart of the scalp, five inches in length. In the course of a day or two, she became feverish, talked incoherently, vomited several times, and was exceedingly thirsty. Notwithstanding antiphlogistic remedies, the symptoms soon became worse; the child being in a state of stupor, and of a deadly pale colour, with twitchings of the face, stertorous and difficult respiration, a tremulous pulse, which could not be counted, involuntary discharge of the feces; frequent convulsions; inability to swallow, &c. The wound of the scalp had united very well at the edges, but the flaps were hollow, and from the cavity an unhealthy matter yet

It is principally in mixed cases, as when a man is labouring under the effects of concussion and compression together, and perhaps inflammation, that obscurity and uncertainty will be experienced.

PRESSURE ON THE BRAIN FROM MATTER.

When a great deal of matter collects on the surface of the dura mater, it finally produces symptoms of pressure on the brain; but, previously to their occurrence, the patient must have betrayed signs of an inflamed dura mater, while, in the situation immediately over the matter beneath the cranium, the symptoms of pressure from this cause must have been preceded by a puffy, circumscribed, indolent tumour of the scalp, and a spontaneous separation of the pericranium. If a wound be immediately over the part of the cranium covering the suppuration of the dura mater, the edges lose their vermilion hue, and become pale and flabby; instead of healthy pus, a thin gleet is discharged, and the pericranium is loosened from the skull, for some extent from the edges of the sore.

This case demands the immediate application of the trephine, in order to let out the matter confined beneath the bone. Antiphlogistic treatment, copious bleedings, saline purgatives, antimonials, quietude, and low diet, are here strongly indicated.*

CONCUSSION.

Its first effect essentially consists in a sort of contusion, or general irritation of the brain, occasioned by the shock which every part of this organ receives. The nature of such shock is readily conceived, when we recollect the way in which contusing bodies act upon the cranium. When the skull is struck, it changes its shape; it becomes flattened in the direction of the violence, and widened in the opposite direction, as happens in the same circumstance to

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issued. Klein was required to apply the trephine, but he thought the symptoms not clear enough, and therefore waited. The child died, and on examination of the body, the cranium and its contents were perfectly sound; but in the chest, the right lung was found violently inflamed, and filled with blood; and a quantity of bloody serum in the cavity of the pleura. The posterior part of this membrane was exceedingly inflamed; a great quantity of blood extravasated between it and the intercostal muscles; and to the surgeon's astonishment, the five first ribs fractured. Chirurgische Bemerkungen, p. 141.

* Besides the kinds of pressure here specified, as requiring the trephine, there is another case particularly insisted upon by Larrey: I allude to the lodgment of a ball or bullet between the fragments of a fractured skull, or to the entrance of the same within the cranium, near some part of which it continues lodged. This author records one surprising case, in which he trepanned the os frontis, and removed an iron ball, that weighed seven French ounces, off the anterior and right lobe of the brain: the patient completely recovered. See Mém. de Chir. Militaire, t. iv. p. 183—185.

every round elastic body. Hence, the brain suffers an universal shaking and compression, and having been contused and irritated, an increased determination of blood to it has always a tendency to follow. The truth of this doctrine is proved by experience, which teaches us, first, that, in the majority of cases, inflammation of the brain succeeds concussion; secondly, that the best method of preventing the secondary effect is to excite an artificial irritation, which counteracts the effects of that to which the brain has been subjected.*

Concussion may happen in very different degrees. How many varieties exist between that slight stunning, the sudden effect of an inconsiderable blow, and that complete disorganization, which, at the instant of the injury, annihilates at once all power of motion and every spark of life!

When the concussion is slight, a transient stunning, a little pain in the head, acceleration of the pulse, vertigo and sickness are sometimes immediately experienced; but, none of these complaints last long, especially if evacuation be used.† In certain instances, however, the dura mater inflames after slight blows on the head, and this at a period when sometimes there is not the least apprehension of danger.‡ If the violence has been great, the patient is directly stunned and thrown into a state of total insensibility; his extremities become cold, his pulse is weak, slow, and intermitting; his respiration hardly perceptible; and his power of motion abolished. This is what Mr. Abernethy considers as the first stage of concussion. In proportion as the stupefaction, arising directly from the injury, goes off, (supposing the violence not to exceed a certain degree, for then no signs of returning sensation follow,) sickness, increased frequency of the pulse and respiration, more or less motion, and other symptoms take place, followed by marks of inflammation of the brain. The tendency to phrenitis, in fact, always increases as the first effects of concussion subside. If the patient's eyelids be now opened, he will shut them again in a peevish manner; the pupil is contracted, and though the patient is regardless of slight impressions, he is not by any means insensible. As the case advances, the patient gets no sleep at all; has a wild look; an eye much like that of a person who has long watched through apprehension and anxiety; talks much and very inconsistently; has a hard labouring pulse; if not restrained, he will get out of bed, and act with a kind of frantic absurdity; and, in general, he appears much hurt by a strong light. As the signs of delirium increase, the pulse becomes small, frequent, and even rapid. The inflammation under the skull may now produce suppuration, or a copious effusion of serum, and the foregoing afflictions may be followed by those depending on the pressure of the secreted fluid.

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* Œuvres de Desault, tom. ii. p. 57, 58.

† Pott's Chirurg. Works, by Earle, vol. i. p. 40, edit. 1808.

‡ For illustrations of this important truth, I would particularly refer to the writings of Pott and Klein.

Death is the unavoidable consequence of violent concussion; such is then the extent of the disorder, that every means is incapable of re-establishing the functions of the brain. But when the injury, which this organ has received, is less considerable, its functions may be gradually restored in a more or less perfect state. Frequently the patient is for ever afterwards affected by the accident. Imbecility, loss of memory, and a marked change in the character are sometimes the permanent consequences. In certain instances, the patient's memory remains weakened, and he can only recollect things, which have very recently attracted his attention. Desault used to cite a curious case, in which the patient could at first only remember circumstances with which the mind had been lately impressed; but afterwards, he could recollect nothing, except what had happened in his childhood. Mention is also made of a lunatic, who was so fortunate as to recover his reason, in consequence of an accidental concussion of the brain.*

The treatment, of which I entertain the highest opinion, consists in taking away blood freely and repeatedly from the temporal artery and arm, giving tartarized antimony, administering saline purgatives, and aperient clysters, and ordering a low diet. In the first stage of concussion, indeed, when all the functions of life are at the lowest ebb, such measures are not indicated; † and stimulants (especially external ones) may be allowable; but, when the second stage arrives, which is invariably joined with a tendency to inflammation of the brain and its membranes, the antiphlogistic treatment affords the best chance of preservation. Counter-irritation should also be excited on the outside of the head, by means of a large blister. Leeches will often be useful, and linen, wet with a cold lotion, may be laid on the temples, and any part of the head not covered with the blister.

Copious bleeding has not been universally approved of as a means of relieving concussion. In a few cases, Desault bled once; but he never carried the bleeding so far as to open a vein a third ‡ time. He preferred a stimulating plan of treatment, and especially that of keeping up a counter-irritation on the whole scalp, and giving antimonials.

Others, not content with external stimulants, have had recourse to the internal exhibition of opium, brandy, wine, liq. ammoniæ, and æther. This practice, I think, arose from the two stages of concussion not having been formerly discriminated.

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* Œuvres de Desault, tom. ii. pp. 59—61.

† Mr. Hey, among others, thinks a copious bleeding injurious "during the diminished state of the vis vitæ, which immediately succeeds the injury." He has seen great benefit arise from the warm semicupium, and blistering the head after topical bleeding. Pract. Obs. in Surg. p. 486. edit. 2.

‡ Op. cit. p. 64.

PHRENITIS.

When, in consequence of external violence, the substance of the brain inflames, the case is attended with hardness, frequency, and strength of the pulse; slow full respirations; broken sleep; redness of the tongue; animation of the countenance; excessive sensibility of the retina to the impression of the light; a full, red, and inflamed appearance of the eyes; an acute throbbing pain in the head; general heat of the body; disturbance of the intellectual faculties; and, after a time, vertigo, loss of sense, delirium, coma, and convulsions. But, when the membranes of the brain are principally affected, the pulse is contracted, frequent, and small; the fever characterised by a dull pain in the head, dryness and burning heat of the skin; vomiting; clammy furred tongue; high-coloured urine; delirium, loss of sense, &c. In most examples, however, the brain and its membranes are more or less inflamed together, and hence, in general, the symptoms do not precisely correspond to either of these descriptions.

Inflammation of the brain, and its membranes, is a case that generally requires a very free use of the lancet, and the operation is to be repeated, according to the patient's strength, and the state of the symptoms. There is an advantage in taking blood from the temporal artery; or, in conjunction with venesection, blood may be drawn from the temples by leeches, or cupping glasses. The skin ought to be kept moist with antimonials, which should be given in nauseating doses, so as to have the effect of suddenly lessening the impetus of the circulation. Counter-irritation should be excited on the scalp with blisters, or, at first, the head may be covered with linen wet with ice-cold water, or an evaporating lotion. Laxative glysters, saline purgatives, a very low diet, and a quiet, rather dark room, are also proper.

THE OPERATION OF TREPHINING

Consists in removing a portion of the skull, and is usally done in order to raise a part of the bone producing dangerous pressure on the brain; to discharge collections of matter, or blood, which have the same effect; or to extract a ball, or other foreign body lodged under the skull.

Every part of the cranium cannot be trephined with equal safety. However, the mere presence of a suture ought not to deter the surgeon from making the perforation in any place which seems advantageous. I believe, also, that the fears, respecting wounds of the longitudinal sinus, have been vastly exaggerated, and that if the situation of a depressed fracture, or extravasation, demanded the removal of a piece of the skull directly over this vessel, the operation would be justifiable. The longitudinal sinus has often been wounded by spiculæ of the cranium, in cases of fractures; and it has been purposely punctured with a lancet, in order to bleed the patient; yet, the hemorrhage was never known to be troublesome, after a little bit of lint had been applied.*

But, though I feel warranted in making this statement concerning the longitudinal sinus, I am not acquainted with any facts, showing that hemorrhage from the lateral sinuses would not be likely to prove more serious. These latter are much larger, and as they occupy the deep transverse furrows, in the middle of the inner surface of the os occipitis, a trephine applied over them would inevitably wound them.

Authors generally interdict the application of the trephine to the anterior inferior angle of the parietal bone, on account of the trunk of the spinous artery of the dura mater being situated in a groove on the inner surface of that part of the skull. For my own part, I should never be afraid of trephining here; for, if the above vessel were wounded, a little dossil of lint, introduced into the opening, would immediately stop the bleeding.

It is a maxim to avoid trephining any part from which a complete circle of bone cannot be sawn, without hurting the dura mater. The inequalities on some parts of the inner table of the skull, make attention to this rule necessary. Thus, the centre of the forehead is rather an inconvenient part for the trephine, because, when the spine of the os frontis is prominent, it could not be sawn, without the dura mater being wounded by the teeth of the saw. Should the surgeon apply the trephine to this place, he must be careful not to saw too deeply; and complete the separation of the circle of bone with the elevator, instead of making any dangerous attempt to saw entirely through the projecting spine.

Surgical writers caution us not to trephine over the frontal sinuses, and, not without reason; for, if the perforation be continued in the direction in which it begins, the inner table will be sawn entirely through, on one side of the circle, before the other is at all divided. However, the outer table may be first removed with a large trephine, and the inner table then perforated with a smaller one, placed evenly and perpendicularly on the posterior surface of the sinus.†

The trephine cannot be applied lower down on the forehead than half an inch above the superciliary ridge of the os frontis, without risk of injuring the orbit. If requisite, the trephine may be applied to the squamous portion of the temporal bone; for, wounds of the temporal muscles are not at present so much dreaded as they were by our ancestors. The unevenness of the os occipitis; the course of the longitudinal and lateral sinuses; and the way in which a part of this bone is covered by muscles; have made surgeons fearful of applying the trephine to it. However, there are two small spaces on each side of the groove for the longitudinal sinus, where a trephine may be safely applied.* The operation may even be done below the transverse ridge, near the foramen magnum, the muscles attached to that part of the bone being no valid objection, as a division of them is not dangerous, while unrelieved pressure on the cerebellum would certainly be fatal.†

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* Cases in Surgery, by J. Warner, p. 8. edit. 4.; Marchetti, Obs. 4. Sharp's Operat. p. 144. edit. 5.; Pott's Chirurg. Works, vol. i. p. 156—159. edit. by Earle. 1808.

† C. Bell's Operative Surgery, vol. i. p. 439.

When the bone is already sufficiently exposed by a wound, the operation may commence at once; but otherwise, it is first requisite to make room for the application of the trephine, by making an incision of a crucial form, or shaped like the letters T or V. None of the scalp should ever be removed, as it is quite unnecessary, and might afterwards occasion serious deformity.

The incision should be made directly down to the bone; but, in cases of large fractures, attended with great separation of the broken edges, or with loose pieces, the danger of pressing too hard with the knife is obvious.

Mr. Pott informs us, that a suture, or the impression of a vessel on the surface of the bone, may be discriminated from a fracture or fissure, by the undetached state of the pericranium. This membrane is always found loose and detached from the track of a fracture; besides which, the edges of a fracture constantly seem rough to the probe or finger. The natural situation of the sutures is also a source of information to a surgeon, not deficient in anatomical knowledge.

It would be dangerous to apply the trephine to depressed portions of the skull. The perforation is always to be made on that side of the fracture, where the elevator can be most conveniently introduced beneath the depressed bone for the purpose of raising it. In cases of extravasation, the perforation ought to be made at the place, where there are traces of violence done to the scalp.

When the scalp has been divided, and loose splinters of the cranium are found under it, they ought to be taken away with the forceps or finger; for, they can only be regarded as extraneous bodies, the continuance of which may be productive of dangerous irritation. The depressed pieces of the skull, causing the bad symptoms, are sometimes completely detached from the rest of the cranium, and may be taken away in the same manner.

In every instance of fracture with depression, unattended with any motives for supposing that part of the pressure on the brain arises from extravasation, provided such depressed fracture can be raised with a pair of forceps, or an elevator, without applying the trephine, the latter operation may be dispensed with.

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* See Warner's Cases, p. 18. edit. 4.

† Med.-Chir. Trans. vol. ii. p. 104.

It is customary to scrape the pericranium from the part of the bone on which the crown of the trephine is to be placed; but, if this instrument cut well, no such proceeding is necessary.

In order to fix the centre-pin of the trephine, surgeons make a small hole in the external table of the skull with an instrument named a perforator. The crown of the trephine is to be alternately turned in one direction, and then in the other by the pronation and supination of the surgeon's hand. As soon as the teeth of the instrument have made a circular groove, sufficiently deep for fixing the trephine, the centre pin is to be removed, lest it should injure the dura mater, before the internal table of the cranium is perforated. At first, the operation may proceed with briskness, as the surgeon cannot possibly do mischief; and, every now and then, the trephine is to be taken out of the circular groove, in order that the bone dust may be brushed from the teeth of the instrument.

When the sawing is more advanced, the surgeon must proceed with greater caution, and frequently examine with the point of a quill, whether any part of the circle is nearly, or completely sawn through. When this is the case, the pressure of the instrument is to be inclined to the parts, which are not sufficiently perforated. It is always better to use a little force in raising the circle of bone with the elevator, than to run any risk of injuring the dura mater and brain, by sawing two deeply.

In a few cases, the surgeon clearly perceives the entrance of the saw into the diploe, by the sensation which the instrument communicates to his fingers, in consequence of entering a soft substance, immediately after having divided the hard texture of the outer table, and by the blood which then appears in the circular groove, and on the teeth of the saw. The operator, however, is not warranted in sawing too boldly until a criterion of this sort takes place; for, in many skulls, and in different parts of the same skull, the diploe is very thin, and, in old persons, it is sometimes quite obliterated.

When the surgeon knows with certainty that he has arrived at the diploe, the rest of the sawing should be accomplished with slowness and circumspection. After having removed the circle of bone, if the lower edges of the perforation next the dura mater are splintered, they may be made smooth by means of an instrument, called a lenticular.

When the whole track of the depression cannot be raised, or all the blood or matter cannot be discharged, by making one perforation, the trephine must be applied again; and indeed as often as the circumstances of each particular case demand. Sawing out large portions of the skull, however, should always be avoided, if possible, because it may be itself the source of bad and even fatal consequences; but it is certainly less dangerous, than not completely effecting the object of the operation, viz. the removal of the pressure from the surface of the brain. Pain is here no objection; for the majority of patients, on whom it ought to be practised, are in an insensible condition.

When the operation is finished, the scalp is to be laid down in its natural position, and dressed very lightly with a pledget of any simple unirritating ointment.

The importance of preserving every part of the cranium, which the safety of the patient does not compel us to remove, is a truth with which I am forcibly impressed. Nor can it be disputed, that the trephine is often an objectionable instrument, since the piece of bone sawn out must always be of one figure, whatever be the form of the fracture, and the quantity of bone removed must frequently be greater, than the case requires.* Hence the late Mr. Hey seldom used the trephine, or trepan, but saws resembling those delineated in the annexed plate.† With the convex one, the bone may be sawn in a curvilineal direction. There are undoubtedly numerous cases, in which it is unnecessary to remove a whole circle of the cranium for the purpose of raising a depression; for instance, if the fracture were shaped like the letter V, and beaten inward, by making a division across its base, the depressed portion might easily be taken away.

CHAP. II.

OF ENCEPHALOCELE; FUNGUS, OR HERNIA CEREBRI.

When a portion of the brain, together with its membranes, protrudes through a preternatural opening in the cranium, the disease receives the above appellations. There are several varieties of this affection.

One case sometimes occurs in young children before the ossification of the cranium is completed, and then the tumour is covered by the common integuments of the head. In one example of this kind, the falciform process of the dura mater was contained in the swelling.‡

This species of encephalocele usually appears as a soft, smooth, round tumour, which has a pulsation corresponding to that of the arteries. It yields and disappears under compression, is generally unattended with any change in the colour of the skin, is formed in the situation of the fontanellæ and sutures, and its circumscription depends on the extent of the deficiency of bone.§ The proper treatment is to keep up a moderate pressure on the swelling. Ferrand successfully employed for this purpose a compress, containing a piece of sheet-lead, and fastened to the child's cap exactly

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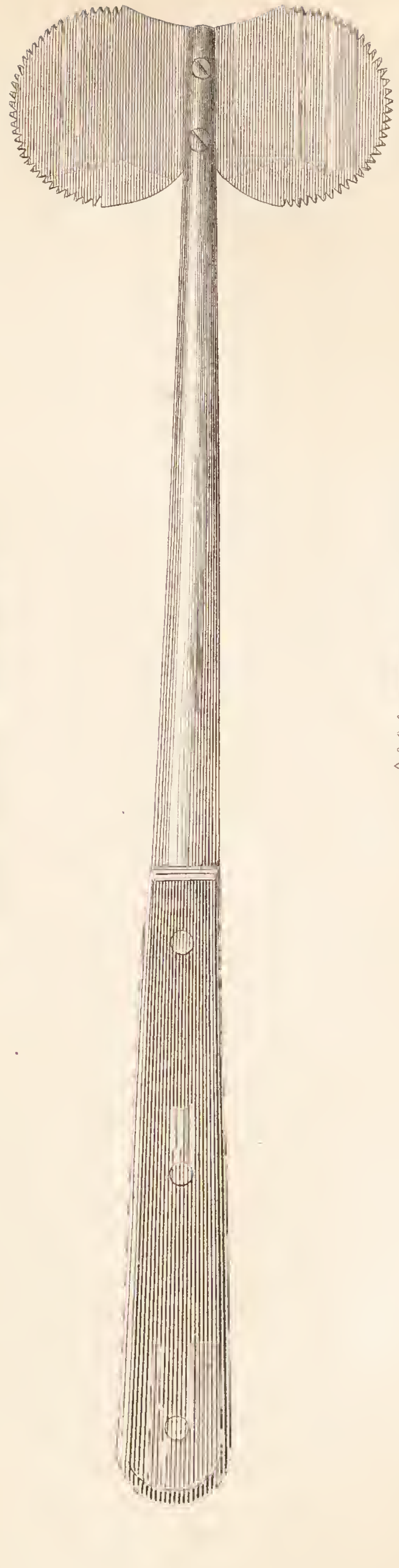
* See Hey's Practical Obs. in Surgery, p. 7. edit 2.

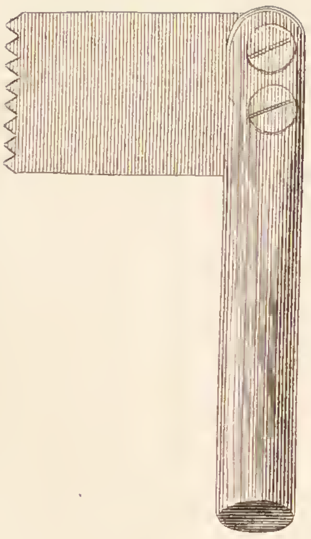
† Plate 1.

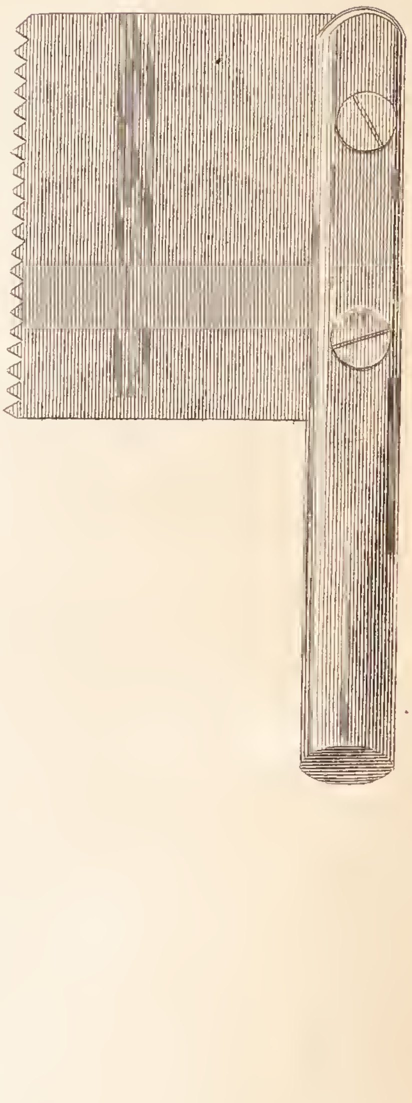
‡ Corvinus de Hernia Cerebri, in Haller. Disp. Chirurg. t. ii. p. 333.

§ Ferrand, Mem. de l'Acad. de Chirurg. tom. v.

Plate 1.







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over the tumour. The degree of pressure was increased or diminished, as occasion required, by tightening or slackening the cap.

Another species of encephalocele is rather to be regarded as a malformation, being the consequence of a congenital deficiency of an extensive portion both of the cranium and scalp. In such cases, the infant is generally still-born, or dies soon after birth. A remarkable example of this disease was published by Dr. Burrows. The scalp, the os frontis, the parietal, and a great part of the occipital bones, were wanting. The cerebrum, which projected through the deficiency, was of a mulberry colour, and the tumour was adherent at its neck to the edge of the integuments. This child lived till the sixth day after its birth; it had no power of voluntary motion, and all the secretions were stopped.* In one case, where there was a deficiency of the skull at birth, the plexus choroides was found in the contents of the tumour under the scalp; and, in another instance, the cerebellum.†

The foregoing kinds of encephalocele are rare compared with others, which sometimes follow the destruction of a part of the skull by disease ‡, or the operation of trephining. In the latter case, the tumour generally arises a few days after the perforation of the cranium. It protrudes through an ulcerated opening of the dura mater, and very soon attains the magnitude of a pigeon's or hen's egg, the pia mater covering it seeming inflamed. As it enlarges, frequent hemorrhages occur, and its surface is commonly darkened with coagulated blood. In a few cases, it is not attended with loss of the mental faculties, though, in most instances, we find that coma, insensibility, and other marks of pressure on the brain, accompany the disease.

According to Mr. Abernethy, this singular case proceeds from an injury done to a part of the brain at some distance from its surface, which injury produces a diseased state of the vessels, similar to what occurs in apoplexy. The morbid state increasing, one or more vessels give way, and an effusion of blood in the substance of the brain follows. This occurrence, if the skull were entire, would probably occasion apoplexy; but when there is a deficiency of bone, allowing the brain to expand, this viscus and its membranes protrude through the aperture. The dura mater soon ulcerates, and the tumour rapidly increases, in proportion as the internal hemorrhage goes on. At last, the pia mater, and stratum of the brain, covering the effused blood, give way, and the blood oozes out and coagulates. § In the cases recorded by Mr. Stanley, however, the protrusion consisted both of the cortical and medullary substance of the brain, and the effused blood is described, as merely lying upon the surface, and not extending thence to any other place, in which it had been originally effused.*

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* Med.-Chir. Trans. vol. ii. p. 52.

† See Richter's Anfangsgr. der Wundarzn. b. ii. p. 198. ed. 5.

‡ Richter's Chir. Biblioth. 2 B. 1 St. Seite 159.

§ Surgical Works, vol. ii. p. 51.

That all cases do not correspond with Mr. Abernethy's description is certain. Thus we have on record the account of a man who, without having any previous disease or accident, became afflicted with a pulsatory swelling, which originated from the substance of the anterior part of the left lobe of the brain, protruded through the os frontis, was as large as an orange, and on dissection was found to resemble the medullary matter of the cerebrum in appearance, and to be covered by an elongation of the dura mater.†

Mr. C. Bell represents the hernia cerebri as a true organized vascular growth from the substance of the brain, and not as a mere protrusion. He has seen the disease arise after an exfoliation of the two tables of the skull, when no blow had happened to cause any rupture of blood-vessels within the brain; and he states, that the removal of bone and the ulceration of the dura mater always precede the growth of the fungus.‡

The proper line of surgical conduct in such cases as follow trephining, is hardly yet determined. Mr. Hill successfully pared off the tumour with a knife in several instances §; and patients have been known to tear off the whole tumour, without any particular ill consequences. || In the case recorded by Mr. Pring, the removal of the protruded mass, and the employment of pressure, were followed by the recovery of the patient.¶ The French surgeons also recommend either cutting the tumour away, or repressing its growth by applying turpentine to it, and gentle pressure.** In one instance lately published, the whole tumour, which equalled a small orange in size, "was sliced off with a scalpel," without any particular pain being excited. A profuse hemorrhage took place from the exposed surface of the brain, "the blood being thrown with great force, and to a considerable distance, from numerous vessels, which were attempted to be secured, but ineffectually, by ligatures. After a short time, however, the bleeding ceased." On examination of the part which had been cut off, its exterior was found to consist merely of a layer of coagulated blood, the rest of the mass was brain, possessing a natural appearance, the distinction between the cortical and medullary matter being readily seen, with the convolutions and pia mater descending between them. During the remainder of the day, on which the operation had been performed, the boy, on the

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* See Medico-Chir. Trans. vol. viii. p. 12, &c.

† Med. Trans. art. 18.

‡ Operative Surgery, vol. i. p. 428.

§ Cases in Surgery, p. 91, 92.

|| Mém. de l'Acad. de Chir. tom. i. Mém. par M. du Quesnay, obs. 10.

¶ Edinb. Med. and Surg. Journ. vol. ix.

** Richerand Nosogr. Chirurg. tom. ii. p. 289. edit. 2.

whole, was more tranquil. For the next two days, he remained much in the same state; but, on the third, he became worse; was completely insensible; had strabismus, and a remarkable quickness of the pulse. On the following morning he died." *

On the whole, the results of various cases on record appear to sanction the application of pressure, which, in cases where the tumour is already large, must be preceded by a removal of the protruding mass with a scalpel Considering the state of the brain, I should also be generally inclined to combine with such treatment copious bleeding. In one interesting case, where the whole swelling had been removed down to a level with the skull, the cut surface of the brain bled freely from numerous vessels of large size. Firm pressure was then made. The disposition to protrusion after a few days ceased. The protruded matter, which had hitherto resembled healthy brain, now put on another appearance. The exposed cerebral substance lost its natural colour, acquired a light yellow appearance; was split into several portions; and a fetid odour exhaled from it. Its substance daily became softer, and the whole gradually wasted away. As the dead and putrid brain was detached, *fresh granulations rose up to fill the vacancy, evidently produced from the exposed substance of the brain.* During these changes, which occupied several days, the boy's health was good. At each dressing of the wound, moderate pressure was still made. By this means, the granulations, filling the space before occupied by the protruded brain, became daily more flattened, and at length brought down to the level of the skull, when their cicatrization commenced, and proceeded with such rapidity, that, in a few days, the whole wound was perfectly healed, and the boy in every respect well.†

Unfortunately these are generally complicated cases, the brain being deeply and extensively diseased. Thus, in the examination of one case, after death, it was found, "that all that part of the dura mater, adjacent to the ulcerated aperture, through which the brain had protruded, was black, sloughy, and much thickened. The exposed surface of the brain, from which the portion had been cut off, exhibited a softened and broken down texture; a state of disorganization, which extended deeply into its substance. About an ounce of fetid and dark-coloured fluid was found between the dura mater and arachnoid membrane, several small effusions were met with both between the membranes and in the substance of the brain. The arachnoid coat was thickened and opaque over each hemisphere," &c. ‡

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* Stanley, in Med.-Chir. Trans. vol. viii. p. 15. The pressure, which was endured without ill effects in the examples related by this gentleman, is truly surprising.

† Stanley in Med.-Chir. Trans. vol. viii. p. 20—22.

‡ Ibid. p. 16.

CHAP. III.

FUNGOUS TUMOURS OF THE DURA MATER.

Fungous tumours sometimes grow from the external surface of the dura mater, and, after destroying the super-incumbent portion of the cranium, make their appearance in the form of an external swelling under the scalp. They are generally preceded by a blow, or fall on the head, and occur at the part to which the violence was applied.

As the fungus grows larger, its pressure against the skull, and particularly its pulsatory motion derived from that of the brain, occasion a slow and gradual absorption of the bone, just in the same way as an aneurismal tumour destroys any part of a bone against which it happens to press. The portion of the cranium immediately over the swelling being absorbed, the fungous excrescence meets with less resistance; it quickly protrudes through the opening in the skull; forms a prominent tumour under the scalp; and enlarges with increased rapidity. The severe pains in the head, which precede the external appearance of the disease, become still more violent as soon as the fungus protrudes through the opening in the bone, and is irritated by the sharp inequalities of its edge. The swelling has a manifest pulsation, corresponding to that of the arteries, and when compressed, it either returns entirely within the cranium, or is considerably lessened. The pain then subsides, the tumour being no longer irritated by the irregular circumference of the opening in the skull. If the size of the fungus be large, no relief can be thus obtained; for, when an endeavour is made to reduce the tumour, all the alarming symptoms of pressure on the brain are immediately excited.

Fungous tumours of the dura mater constitute a very dangerous form of disease, and mostly prove fatal.

Before a fungus of this description has made its way through the cranium, and projected under the scalp, so that its nature and existence can be ascertained, the practitioner has no opportunity of attacking the disease with any effectual means. The ordinary treatment of the severe pain occurring in certain parts of the head, after blows or falls on the cranium, and before the fungus protrudes, has consisted of bleeding and evacuations. But when the disease has manifested itself in the form of an outward swelling, the nature of which is recognised from previous circumstances, as well as from the pain which attends it, and subsides on its reduction, and its pulsatory motion; the head should be shaved, a crucial incision made in the scalp covering the fungus, the angles dissected up, and the whole of the tumour, and the margin of the opening through which it protrudes fairly exposed. But as it is impossible to get at the entire root of the fungus, while it is closely embraced by the cranium, it becomes necessary to saw away the surrounding bone. This object has generally been accomplished very inconveniently with the trepan or trephine, which, while it cuts away more of the cranium than is requisite, cannot effect the removal of every part of the bony circumference, and the surgeon is obliged to break away the pieces betwixt the perforations. The best instruments for cutting away the surrounding part of the cranium, are Mr. Hey's saws.

The root of the fungus being thus exposed, the next business is to cut the swelling away, which is most effectually done by carefully dissecting out the part of the dura mater with which it is connected.

The excision of fungous tumours of the dura mater is far better practice, than applying ligatures or caustic to them.

CHAP. IV.

WOUNDS OF THE FACE.

As any disfigurement of the face is peculiarly conspicuous, it is always a great point to prevent the formation of ugly scars upon it. Hence, it is an invariable maxim to endeavour to heal its wounds by the first intention.

As cuts, confined to the soft parts of the face cannot be deep, adhesive plaster is generally sufficient to keep them closed; but, when the wound is situated in one of the lips, the part is so incessantly in motion, that surgeons find it advantageous to maintain the sides of the division in contact by means of the twisted suture.

When the edges of the wound are much contused and lacerated, they should be pared off, to increase the chance of union, and lessen the future scar.

Sabre-strokes, directed obliquely downward against the face, often produce a wound attended with a flap, which should be immediately laid down in its proper situation again. When the flap is large and muscular, a suture may be applied at one or two points.

Sabre-wounds sometimes break and splinter the bones of the face. The fracture, however, seldom extends far, because most of these bones are soft and spongy. Notwithstanding this complication, the soft parts frequently admit of being evenly united, particularly if care be taken to extract all the splinters, and put the surfaces of the division of the bones accurately together. Unless the fragments be quite detached, they should never be taken away, but be replaced as well as circumstances will permit. Their removal is not an easy matter; it occasions an unpleasant disfigurement; and experience proves, that all divisions of these bones heal with great readiness.*

A very terrible sabre-wound of the face is recorded by Dr. Hennen. The weapon struck an officer nearly across the eyes, one of which it destroyed; it then divided the parts downwards and backwards, to such an extent, that the pharynx could be seen.† Yet the injury healed very favourably, as indeed do the generality of wounds of the face, owing to its great vascularity. In some horrid cases, where the lower jaw is torn away by a cannon-shot, life is preserved; but, in general, the patient sinks under the accumulated tortures of his situation. "It is still, however, our duty to try every expedient; and, after the ragged parts and splinters of bone are removed, the vessels within reach secured, and the suppurating process fairly established, we may endeavour to assist nature, faithfully following any effort she may make to fill up the chasm, but without allowing ourselves to count upon a showy or complete cure."‡ Dr. Hennen saw one dreadful case recovering, in which nearly one half of the face had been carried away by a round-shot at Waterloo. Larrey has recorded a similar case §; and I witnessed in Holland a recovery of the same nature. It was the case of a soldier wounded at Bergen-op-Zoom, in 1814. All the lower jaw, and a large part of the upper, were in this instance completely torn away: there was very little hemorrhage, and no vessels required ligature. In injuries of this description, the usefulness of an elastic catheter for the conveyance of food and medicines down the æsophagus, is often very great.

Wounds of the lower part of the forehead or eyebrow, are sometimes followed by the disorder named *ptosis*, in which the upper eyelid hangs down; but, they more commonly give rise to an opposite complaint, called *lagophthalmos*, in which, from the contraction of the cicatrix, the skin is drawn up, and the eyelid cannot cover the eye.

Wounds of the eyebrow are sometimes followed by amaurosis, a case generally very difficult of cure.

Wounds of the eyelids scarcely admit of an effectual application of adhesive plaster, and are generally brought together with a suture.

Cuts of the ear usually heal very favourably. A suture may be advantageous; but, it need only be passed through the skin, and not through the cartilage. Ravaton has recorded a case, in which the ear united again, though nearly separated from the head; and it is important in every similar instance to make the attempt, since the loss of the external ear would create an imperfection of hearing.

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* Anfangsgr. der Wundarzn. band. i.p. 244. edit. 5.

† Obs. on Military Surgery, p. 370.; also, Larrey, Mém de Chir. Militaire, t. iv. p. 20.

‡ Op. cit. p. 375.

§ Mem. de Chir. Mil. t. iii. p. 328.

When a part of the nose is divided, but not entirely detached, it is the duty of the surgeon to replace it as expeditiously as possible, and retain it in its situation with strips of adhesive plaster, and, if necessary, a suture. Putting out of the question Garengeot's extraordinary case, to which I have elsewhere adverted, we have many facts on record, showing not only that most incised wounds of the nose admit of union, but also, that contused ones, attended with an almost complete detachment of the part, may often be united.*

As the parotid duct passes beneath the integuments of the cheek over the masseter muscle, it is much exposed to wounds, which, if not properly treated, end in what are termed salivary fistulæ.

CHAP. V.

SALIVARY FISTULÆ.

A SALIVARY fistula is an opening on the cheek, from which the saliva escapes, more especially when the patient is eating or talking, and it flows out so profusely as to wet the patient's clothes. During a meal, two ounces of it have been known to escape in the short space of a quarter of an hour. The great loss every day of a fluid so serviceable in digestion, produces loss of appetite, indigestion, weakness, and emaciation; and the constant dribbling of the saliva over the adjacent parts, is at least a vexatious annoyance.

A wound, an ulcer, or gangrene extending either to the parotid gland or duct, is the cause of the disorder. When the first part is interested, the fistulous opening is close to the ear; when the duct itself is concerned, the aperture is on the cheek. Sometimes calculous concretions are formed in the parotid duct, like those frequently met with in the salivary ducts under the tongue. In general, they do not cause much inconvenience before they are large, when they occasion an abscess, which either bursts on the cheek, or is opened; and, if the nature of the case should not have been previously suspected, it now becomes evident, from the quantity of saliva discharged from the aperture; the sore not healing, but becoming fistulous; and the facility, with which the calculus may be felt with a probe.

When the parotid duct is recently wounded, an attempt may be made to unite the wound by the first intention, in the expectation that one end of the duct itself may, at the same time, coalesce with the other. But when the wound has existed a good while, the latter hope would be vain; for the part of the parotid duct, detached from the gland, is generally too much shrunk, or even quite obliterated.

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* Richter's Chir. Bibliothek, 6 B., seite 538. Larrey, Mém. de Chir. Militaire, t. iii. p. 328, t. iv. p. 20, &c.

Another plan, commonly pursued, is to apply a graduated compress to the fistulous aperture, or more properly just at its outer edge. M. Pipelet devised an instrument for making the requisite pressure.* In this manner, fistulæ of the parotid gland itself may generally be cured. But when the fistula proceeds from the duct the method seldom answers, unless the wound be quite recent, and the pressure not likely to be required long; for then the hinderance of the excretion of the saliva gives rise to a painful and œdematous enlargement of the gland, extending a considerable way down the neck.

Desault cured a salivary fistula of the parotid duct by means of pressure, but quite on a new principle. After compression of the duct had been tried in vain, he laid compresses over the parotid gland, and bound them on the part with a roller, enjoining the patient to live entirely on liquid food, and abstain from talking. The bandage was tightened anew every day. By pursuing this method a certain time, the gland wasted away, its function was abolished, no more saliva passed into the duct, and the fistulous opening healed. Disorder of the digestive organs, from a less quantity of saliva being secreted, need not be apprehended; for the opposite parotid, and the rest of the salivary glands, make up the deficiency by augmenting their secretion. †

The application of caustic to the fistulous aperture is another method. It is practised with the view of producing an eschar, sufficient to close the opening, and prevent the issue of the saliva, when the fistula sometimes heals under the slough. Dr. Gibson has found this practice very successful, and prefers it to the seton. ‡

Efforts have been made to re-establish the obliterated part of the duct, by passing a probe from the fistulous aperture through it, and keeping it open with a seton, or style, introduced into the mouth. Frequently, however, the re-establishment of the original duct is not so easily accomplished, as making a new and more direct channel for the saliva into the mouth. The perforation should be made close to the end of the fistula, and be, as it were, a continuation of it. A seton is then to be employed for keeping it open, while means are taken to heal the fistulous orifice.

When the trocar had been introduced, Desault used to withdraw the stilette, and pass a thread into the mouth through the cannula. This was then taken out, and the seton drawn, by means of the thread, from within the mouth into the wound: but care was taken not to draw it through the external opening, out of which only the single thread passed, and it was fastened to the cheek with a bit of sticking plaster. The outer aperture was now dressed with lint, covered with compresses wet with the lotio plumbi acetatis. Thus the external opening had an opportunity of healing, with the exception of a mere point: afterwards, the seton was taken out, and the little aperture touched with the argentum nitratum.

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* Mém. de l'Acad. de Chirurgie, tom. v. p. 869. tab. 19.

† Œuvres de Desault. par Bichat, tom. ii. p. 218—220.

‡ Institutes, &c. vol. i. p. 155.

During the treatment of these cases, it is necessary that the patient refrain, as much as possible, from masticating or talking, and his food should consist of liquids.

CHAP. VI.

THE HARE-LIP

Is for the most part a congenital malformation; but it is now and then produced by accidental wounds. It is mostly met with in the upper lip, and very seldom in the lower. Sometimes there is only one fissure; on other occasions, there are two. When, in the latter instance, the intervening substance is sufficiently broad and long, it is best to preserve it in the operation; but, if narrow and short, it should be cut away. In some case, the fissure only extends as high as the middle of the lip; in others, it reaches to the nose, and even into one of the nostrils, which is then much expanded. Besides the fissure in the lip, there is frequently so large a cleft in the upper jaw and palate bones, as to convert the mouth and nose, as it were, into one cavity. Sometimes, there is a fissure in the soft palate, though, for the most part, this is perfect. In certain examples, the jaw-bone, or teeth, project forward into the cleft of the lip.

A hare-lip, besides being a great deformity, is attended with a defect in the speech; and when the fissure extends along the palate, there is more or less impediment to sucking and swallowing.

In ordinary cases, the cure is easy: the surgeon pares off the margin of the fissure, brings the fresh-cut surfaces into contact, and keeps them in this position, until they have grown together.

As infants are very subject to convulsions after operations, many surgeons think it best to defer the cure of a hare-lip till the child is about two years of age. The youngest subject on which I ever operated was only five months old; but, the case was very successful.

In the operation the wound should be as clean and regular a cut as possible, in order that it may more certainly unite by adhesion, and of such a shape that the cicatrix may form one narrow line. The margins of the fissure, therefore, ought not to be cut off with scissars, which always produce some degree of contusion.

The handle of a wooden spoon, or a bit of pasteboard, may be placed under the lip, and while this is supported and fixed upon it, the edge of the fissure is to be cut off with a sharp bistoury. Or the lip may be held with a pair of hare-lip forceps, in such a manner, that as much of the edge of the fissure as is to be removed, is situated at the side of the upper blade of the forceps, so that it can be cut off with one sweep of the knife, which will be guided along the instrument, as along a ruler. This is to be done on each side of the cleft, and the two incisions are to meet at an angle above, thus Λ, in order that the whole of the wound may admit of being brought together, and united by the first intention.

As the lips are exceedingly moveable, and it is essential to heal the wound by adhesion, the twisted suture is generally employed for keeping its surfaces in contact. Two silver pins, made with steel points, are introduced through its edges, and a piece of thread is then repeatedly twisted round the ends of the pins, from one side of the division to the other, first transversely, then obliquely, from the right or left end of one pin above, to the end of the lower on the opposite side, &c. Thus the thread, being made to cross as many points of the wound as possible, greatly contributes to maintain its edges in even apposition. It is obvious, that a great deal of exactness is requisite in the introduction of the pins, in order that the edges of the incision may afterwards correctly meet. The pins ought never to extend more deeply, than about two-thirds through the substance of the lip. With the view of preventing too much stress upon them, a compress is to be put over each cheek, and bound forwards with a bandage. The pins should be removed in three or four days, the support of sticking plaster, with the pads and uniting bandage, being then quite sufficient.

Hare-lips are frequently complicated with a fissure in the roof of the mouth. When it is confined to the upper maxillary bones, it generally closes after the operation; but when it reaches along the palate bones and velum pendulum palati, its entire closure takes place with less frequency. Whatever was the form of the division in the palate, the experience of Desault taught him, that, if these cases did not invariably admit of complete union *, they at least underwent material improvement, the sides of the fissure becoming in time considerably nearer together. As the complaints, arising from the imperfection of the palate, are also of a very serious nature, the operation should be done at an early period.

Sometimes one upper maxillary bone exceeds the level of the other. When the hare-lip is double, a distinct part of the jaw pushes forward the middle portion of skin. In certain cases, one of the maxillary bones inclines backwards, and its alveolary process juts out. In other examples, an impediment to the union of the hare-lip arises from the projection of a tooth, which must then be extracted.

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* Union has sometimes been accomplished by ingenious modes of applying sutures to the palate; one interesting example of which is recorded in Graefe's Surgical Journal.

When the jaw itself projects, the common preliminary step to the operation for the hare-lip, has consisted in cutting away the bony prominence. But, according to Desault, this measure is seldom proper; for when the original congenital deformity is removed, a disfigurement of the face yet follows, from the upper lip having no proper support. The diameter of the upper jaw is also liable to diminish so considerably, in proportion as the two maxillary bones coalesce, that the upper and lower jaws no longer correspond, and the same kind of inconvenient mastication is produced which is often noticed in old people. Hence, Desault preferred reducing the projection of the jaw, by means of the pressure of a tight bandage, which answers every expectation; for, as there is a fissure in the roof of the mouth, the bony prominence has little support, and readily yields. I recommend surgeons to make the necessary pressure with a small spring-truss, which can be much more conveniently applied, and is less irksome than a bandage, as my own experience has taught me.

CHAP. VII.

CANCEROUS DISEASES OF THE LIP.

What is usually called a cancer of the lip, is met with in various forms; sometimes it has the appearance of an ulcerated, wart-like, excrescence, which occasionally becomes as large as an apple; sometimes it is seen in the form of a very destructive ulcer, which consumes the surrounding substance of the lip; and, in other examples, the disease resembles a hard lump, which at length ulcerates. The disease in its infancy is often a mere pimple, which gradually becomes malignant.

Cancers of the lip are more frequent in men, than women, and generally occur in the lower spheres of life. The upper lip is seldom affected.

Every obstinate hardness and ill-conditioned ulcer on the lips, is not to be regarded as truly cancerous: many cases yield to the remedies mentioned in the chapter on cancer. Keeping the constitution under the influence of either mercury, cicuta, stramonium, or opium, may be tried; but, I believe, generally speaking, that arsenical medicines are the most successful. Many ill-looking, and very obstinate ulcers of the lips, depend on the projection of a sharp rough tooth, the extraction of which is necessary in the treatment.

Whenever the disease is of an unyielding and truly cancerous nature, the sooner it is extirpated the better; and, as the action of caustic cannot be regulated with so much precision as the extent of a wound can be, the knife should be employed.

The operation should be done as for the hare-lip; that is to say, the wound is to be of a shape that will allow its edges to be evenly united. Every portion of the morbid part must also be most carefully removed, lest the disease return. When the affection is extensive, the surgeon is frequently necessitated to remove even the whole of the lip, a great disadvantage, as the patient's saliva can then only be prevented from continually running over his chin by some artificial mechanical contrivance; the deformity is very great; and swallowing, and the pronunciation of words, imperfect.

Many surgeons consider the operation unadvisable, when the glands under the jaw are enlarged.

CHAP. VIII.

DISEASES OF THE ANTRUM.

The diagnosis of inflammation and suppuration in this cavity, is at first not very clear. A darting pain is felt in the side of the face, extending from the teeth to the orbit, and unattended with any external swelling. The pain and tenderness do not affect the integuments, which may be handled without inconvenience to the patient. The state of the disorder is not attended with much fever, and is usually regarded as a tooth-ach.

In some instances, matter flows into the nose; and, its being discharged from one of the nostrils, excites a suspicion of the nature of the case. But many patients do not distinguish the pus from the usual mucous evacuation; and frequently, in consequence of the communication between the nose and antrum being closed, there is no purulent discharge whatever.

The disease, when further advanced, becomes more obvious. The whole antrum now expands, and its parietes are rendered thinner by absorption. The expansion of the bone towards the nose may produce a complete obstruction of the nostril, or its swelling above may raise the floor of the orbit, and push the eye out of its situation. But the greatest degree of expansion commonly takes place towards the surface of the body; for, all collections of matter have a natural tendency to burst in this direction.

At length, the abscess makes its way through the bony parietes of the antrum, and continues to be discharged through ulcerated openings. In some instances, the matter finds a passage into the mouth, through one of the sockets for the teeth.

Although the diagnosis is generally rendered sufficiently plain by the foregoing train of symptoms, yet writers mention a few exceptions, in which the fistulous external aperture, being situated very remotely from the seat of the disease, as, for instance, behind the ear, no suspicion of the case being an abscess of the antrum would be excited, were it not for the swelling of the cheek, &c.

The most common cause of suppuration in the antrum is a caries of one or more of the upper grinding teeth. The general causes, however, capable of exciting local inflammation in any situation, may here have the same effect. An obstruction of the opening, through which the mucus flows from the antrum into the nose, may create such an accumulation of this secretion as shall occasion suppuration.

The indications in the cure are chiefly two, viz. to procure an outlet for the matter as speedily as possible; and to check the suppuration, and promote the separation of any exfoliations which are taking place.

When there is a carious tooth below the antrum, its extraction is proper; for thus not only a source of great irritation is removed, but frequently a depending opening is at once made into the antrum. When the fang of the tooth does not extend quite into this cavity, the perforation must be completed with a sharp gimlet, or perforator. When all the teeth are sound, the third or fourth grinder, is to be selected. The pain and swelling, following the operation, are to be lessened by fomentations; and zinc injections into the sinus may be usefully employed.

Cases present themselves, in which fleshy or bony fungi, or detached portions of dead bone, are situated in the antrum, and in which it is requisite to make a larger opening into this cavity, than can be obtained at its lower part. Instances also occur, in which the patients have lost the grinding teeth, and the sockets are quite obliterated, so that a perforation from below can hardly be effected.

In such cases, practitioners have usually followed the method recommended by Bordenave and Lamorier, and which consists in perforating the malar process of the upper maxillary bone with a small trephine. Another plan was proposed by Desault. After detaching the inside of the cheek from the bone, and exposing the surface of the latter, he drilled a hole into the sinus with a perforator, at the lower part of the fossa canina. The aperture was then enlarged to the requisite extent with the blunt perforator; the corresponding part of the gum was cut away, and a dossil of lint was placed in the opening. For a few days, the cheek was covered with an emollient poultice, and, after the removal of the dressings, the cure was completed by the use of gargles and injections. The perforation was kept open a sufficient time, by occasionally introducing the little finger into it.

The detachment of dead portions of bone is altogether the work of nature; and the only way, in which the surgeon can be useful, is to extract, through proper incisions, all exfoliations as soon as they are known to be loose.

The worst diseases, to which the antrum is liable, are fungous and other tumours growing in its cavity, and producing first an enlargement, and then a destruction of its bony parietes. They frequently produce a complete impediment to the passage of the tears from the eye into the nose; render the eyeball itself motionless, and amaurotic; and ultimately push it entirely out of its socket. The neighbouring teeth also gradually drop out. A sanious fetid matter is discharged from the nostril, the puncta lachrymalia, and even the orbit. The excrescence makes its way through the palate and alveolary processes into the mouth, and, by expanding the bones, completely obstructs the nostril. At last, the swelling protrudes through the cheek, assumes a frightful aspect, and, after attaining this degree, soon proves fatal, the patient dying in a comatose state. On dissection, the greater part of the upper maxillary bone is found destroyed, while the fungous mass occupies not only the antrum, but the whole nostril. The caries sometimes extends to the os ethmoides and orbitar process of the os frontis, a good deal of the anterior lobe of the brain being also destroyed. Numerous are the unfortunate cases of this description on record*, and, in some of them, the want of spirit and judgment in the practitioners consulted in an early stage of the disease, is but too apparent.

The proper treatment is to trephine the antrum as soon as the existence of the disease is known; and to make such a free opening into the cavity, that every atom of the fungus can be conveniently cut out. It is an unfortunate truth, however, that this terrible disease is seldom attacked in the bold and judicious manner advised and practised by the great Desault, who saw more danger in tampering with the case, than in the most decisive measures.

The main object, which this surgeon always had in view, was to remove an adequate portion of bone, so as to allow the distemper to be effectually destroyed at its root. His practice consisted in drilling a hole in the antrum with the perforator, and then cutting away the anterior bony parietes of this sinus with a strong falciform knife, constructed for the purpose; and, if with this instrument he could not remove bone enough, he scrupled not to effect his design by means of a gouge and mallet. Rather than suffer the disease to remain unextirpated, he sometimes broke away part of the alveolary process with the corresponding teeth. As much of the fungus as could be cut away was then removed, and the surface from which it grew, was afterwards carefully cauterized. In these cases, Mr. Liston's cutting forceps would be of considerable service, and obviate all necessity for those rough instruments the gouge and mallet.

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* See Flajani's Collezione d'Osservazioni e Riflessioni di Chirurgia, tom. i. p. 95., where three such cases are mentioned.

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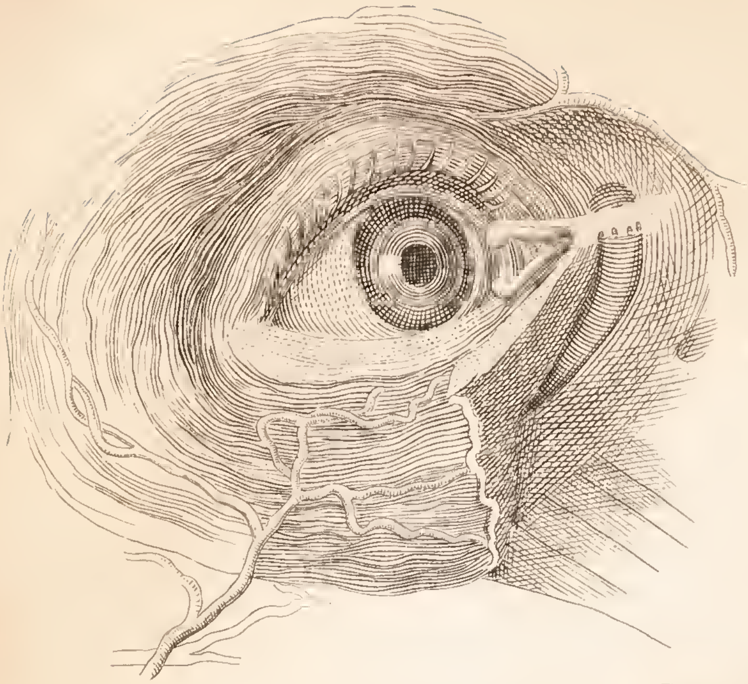

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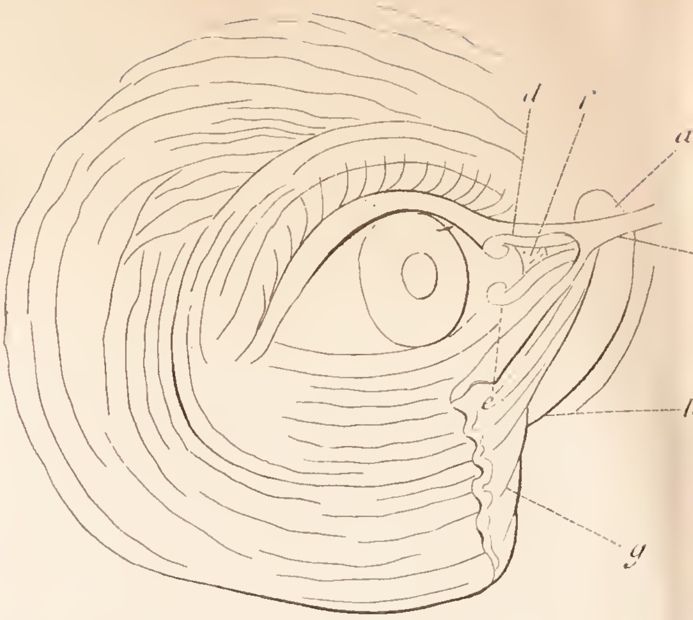

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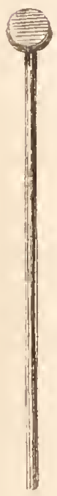

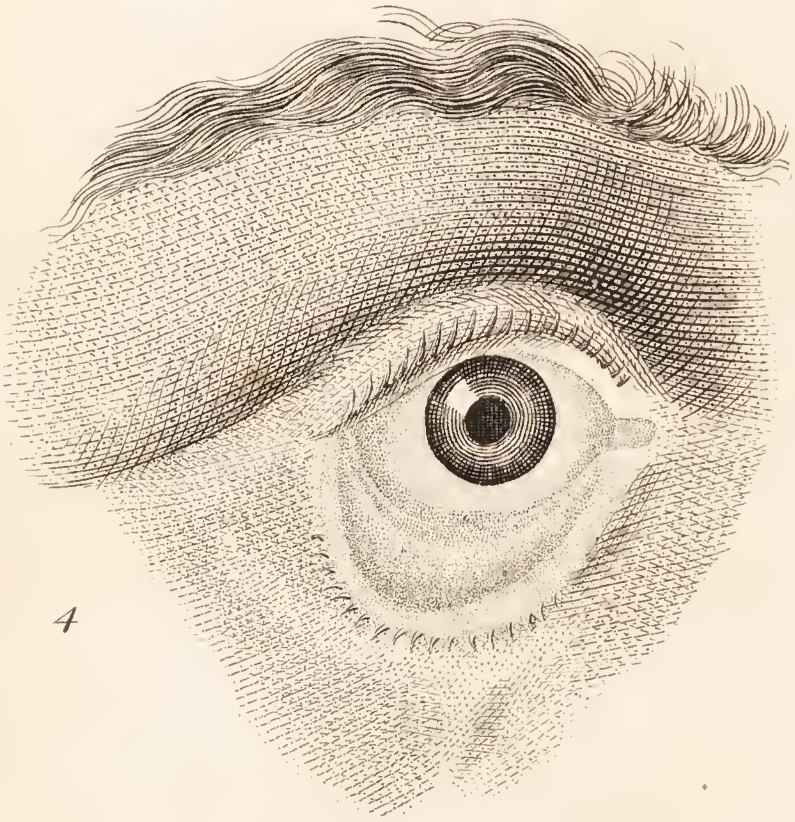

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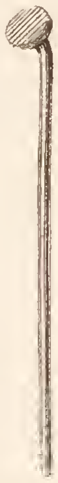

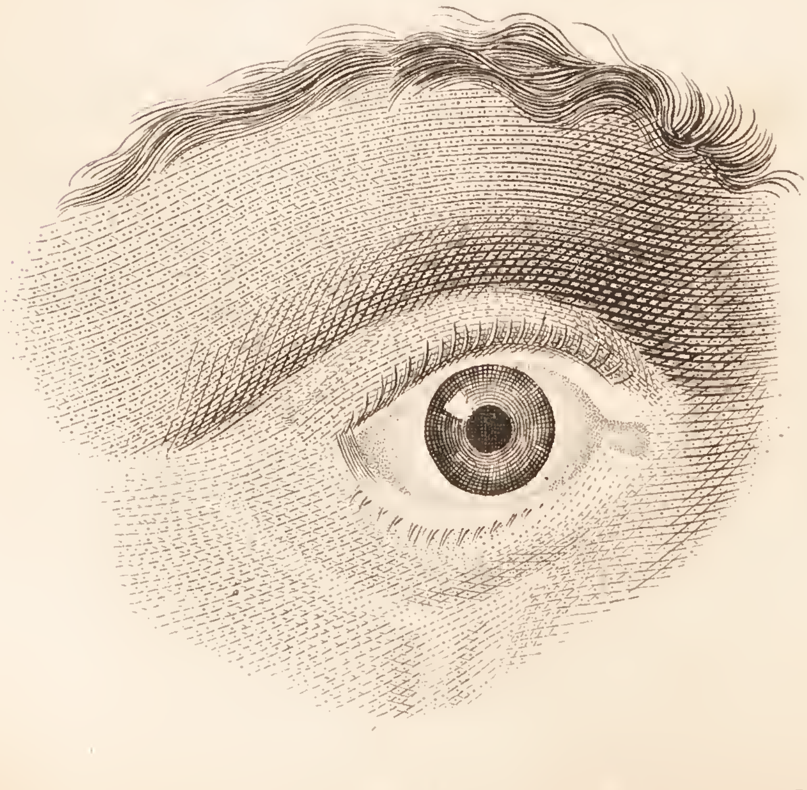

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CHAP. IX.

FISTULA LACHRYMALIS.*

WHENEVER the tears cannot pass freely through the nasal duct into the nose, the lachrymal sac becomes distended, so as to form a preternatural tumour, situated just on one side of the root of the nose, below the internal angle of the eye. The contents of the sac, however, are not merely the tears, but also the mucus which the inner membrane of the tarsus and the sac itself naturally secrete. In consequence of this state, the tears cannot freely enter the puncta lachrymalia; and, every now and then, a drop of them falls from the corner of the eye down the cheek. On compressing the space between the eye and nose, the tumour is for a time diminished, in consequence of its contents regurgitating through the puncta lachrymalia; and also, in some measure, (when the obstruction in the nasal duct is slight,) by reason of their passing down into the nose.

This is the first stage of the disease, absurdly named the *fistula lachrymalis.*

The second stage is, when ulceration has formed in the lachrymal sac an external opening, which is prevented from healing by the contents of the sac continually oozing through it. This state sometimes induces a carious affection of the os unguis, and thus the disease is rendered more complicated. In most instances, the neighbouring eye is more tender than in the healthy state, and, in some, it is always more or less inflamed.

Scarpa asserts, that the chief part of the yellow viscid matter, which accumulates in the lachrymal sac, is secreted by the lining of the eyelids, and by the little glands of Meibomius, and that the altered quality of this secretion has a principal share in the cause of the disease. On the other hand, Mr. Travers considers this doctrine as hypothetical, for various reasons, and, amongst others, because, if it were founded on fact, it would be present in every severe lippitudo, or ophthalmia with purulent discharge, which is not the case.†

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* Lachrymal parts of the eye. Plate 2. fig. 1.
a. b. The lachrymal sac.
c. The tendon of the *orbicularis palpebrarum* muscle.
d. Punctum lachrymale superius.
e. Punctum lachrymale inferius.
f. Caruncula lachrymalis.
g. Portion of the orbicular muscle reflected from the surface of the lachrymal sac.

† Synopsis of the Diseases of the Eye, p. 360.

TREATMENT.

When the tears occasionally trickle over the cheek, in consequence of relaxation of the lachrymal points and canals, after inflammation of the eye, the disease is named by Schmidt and Beer, *stillicidium lachrymarum*, which is easy of cure, the infirmity often ceasing of itself at the approach of warm, dry weather; and when surgical aid is required, it readily yields to astringent collyria. These are to be dropped out of a quill several times a day into the eye, the patient lying down upon his back at the time, and for some minutes afterwards, in order that the operation of the remedy may not be immediately stopped.* When the case depends upon the mere obstruction of the puncta, the introduction of a small silver probe, through them into the sac, once or oftener, as may be required, is alleged to be capable of effecting a cure; but a complete obliteration of these orifices is incurable.† With regard to the epiphora, which depends upon an augmented secretion of tears, and originates from irritability of the eye and its appendages, remaining after ophthalmy, Beer describes the complaint as generally so easy of cure, that it will subside if the patient merely keep himself in a pure, dry, and if possible, warm air; and moderately exercise his eye, especially upon varying objects, &c. But, in unhealthy, irritable subjects, when the disorder is more obstinate, he enjoins, with the preceding plan, attention to diet, and the use of astringent collyria, the most effectual of which, he says, is composed of a solution of nitrate of silver, with a proportion of the acetate of lead and thebaïc tincture. He also recommends the eyelids to be rubbed with the spiritus aromaticus, or a mixture of eau de Cologne and tincture of opium.‡

The first stage of the fistula lachrymalis, sometimes named in this country *epiphora*, and by Scarpa called the *purulent palpebral discharge*, may frequently be cured by very simple means. I shall not enter into the question, whether the morbid state of the Meibomian glands, and of the internal membrane of the eyelids, is the cause, or only an effect, of the obstruction in the ductus nasalis. I think the discussion of this point quite superfluous; for, whether it be one or the other, it is proper to follow the same practice, namely, to make such applications to the inside of the eyelids, as have a tendency to improve the quality of the secretion from them, and to endeavour to restore the free passage of the tears into the nose.

While the lachrymal sac is entire, that is, while the disease is not in an advanced state, the most judicious plan is to inject warm water, at least once every day, into the lachrymal sac, through the lower punctum lachrymale, by means of Anel's syringe, with the view of mechanically washing away any thickened mucus, or other matter, obstructing the nasal duct. If there be marks of inflammation in the situation of the sac, leeches may be applied.

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* Lehre von den Augenkrankeiten, 2ter B. p. 43.

† Travers's Synopsis, p. 366.

‡ Op. cit. p. 45.

At the same time, the patient should employ a collyrium, composed of five grains of the sulphate of zinc dissolved in four ounces of aq. ros.; or he should introduce upon the point of a blunt probe, every morning and evening, between the eyelids and eyeball, a small quantity of the ung. hydrarg. nitrat. mitius.

Perseverance in this treatment, for two or three weeks, will often effect a complete cure. When it does not, and there is no ulcerated opening already, the sac should be punctured, and the duct simply examined with a fine probe: if the probe pass without resistance into the nose, the case (as Mr. Travers correctly remarks) requires no further operative treatment; the integument recovers its healthy condition under an emollient application, the discharge gradually diminishes, and the wound heals. If, on the other hand, upon examination with the probe, resistance is offered to its passage into the nose, a better opportunity will not be had to overcome such resistance. This should therefore be accomplished, and the wound afterwards suffered to heal, without further disturbance.* I consider, that the mild, unirritating treatment, here adopted by Mr. Travers, in preference to that of keeping an extraneous substance in the duct for several weeks, in every respect judicious. However, when the passage of the probe is so firmly resisted, that a good deal of force is necessary to get it down into the nose, some measure is afterwards indispensable to prevent the newly-opened duct from closing again. For this purpose, Mr. Travers introduces a small silver probe, from either of the puncta lachrymalia down the nasal duct into the nostril. Many recent cases, in which the stricture is not very firm, he says, are completely cured by the passage of the instrument three or four times, at intervals of one or two days. When the case is not cured by this method, he introduces a style through the punctum into the nose, and leaves it in the duct twenty-four hours. A day, or two, are suffered to elapse, before the style is introduced again, which is done through the other punctum. On the intervening days, tepid water is injected with Anel's syringe. Whenever the water flows into the throat in a full stream, the further use of the probe is unnecessary; but, if the tears and mucus should not readily pass into the nose, astringent lotions may be injected, and the vapour of vinegar, or of diluted nitric acid, inhaled up the nostril.† The silver style, employed by the late Mr. Ware, (Plate 2. figs. 2. and 3.) has a flat head, like that of a nail, only placed obliquely, in order that when it is situated in the duct, the top may lie in close contact with the skin covering the sac. For an adult, it should be about an inch and a quarter, or an inch and three-eighths in length. A small puncture is made in the sac, when there is no external opening, or this is unfavourably situated. A small probe is now introduced down the lachrymal sac and nasal duct into the nose. The passage is then kept from closing by putting the style into it, and leaving it there. It is to be withdrawn and cleaned twice a week, and warm water injected through the external opening down into the nose. At the end of six weeks, the style may in general be left off, and the aperture healed.

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* Synopsis, &c. p. 364.

† Op. cit. p. 375.

Surgery, I consider to have been truly improved by Mr. Travers's observations on the former officiousness with styles, the keeping of which in the nasal duct for several weeks can, indeed, be rarely proper. The occasional passage of a small probe is certainly better practice; but, for fear of doing permanent injury to the lachrymal puncta and canals, I should prefer introducing the instrument through a small puncture in the skin and sac.

When the os unguis is carious, it may sometimes be proper to make a larger opening into the sac, in order to remove any tedious exfoliations. But, now that the practice of cramming the sac with tents, escharotics, &c. has given place to the mild methods above explained, disease of the bone is found to be a rare occurrence. The perforation of the os unguis, for a new passage into the nose, I think with Mr. Travers*, can hardly ever be so judicious a plan, as that of restoring the natural channel, or of forming one as nearly as possible in the same direction.

CHAP. X.

DISEASES OF THE EYELIDS.

INFLAMMATION OF THE LINING AND MARGINS OF THE EYELIDS.

In this section, are comprised the cases, to which the terms *catarrhal inflammation of the eyelids*, *psorophthalmia*, and *lippitudo*, are applied; the two latter, however, only to certain stages of the disease. According to Mr. Lawrence, catarrhal inflammation of the eyelids begins with soreness, smarting, burning, and dryness of their margins, which become red, swelled, and painful. The palpebral conjunctiva is at the same time red and perhaps villous. As the motions of the eye create great uneasiness, with a sense of stiffness or dryness, the eyelids in an acute attack are kept shut and quiet. Reading and writing, particularly before the fire, bring on pain. A mucous discharge soon takes place from the inflamed membrane, and the pain is then succeeded by itching, (psorophthalmia.) The Meibomian glands participate in the affection, which begins on the ciliary margin of the eyelids. They no longer pour out the mild unctuous matter, which usually softens the edges of the eyelid, but their secretion is suspended, so that, in the morning, these edges are rendered adherent by the increased conjunctival discharge, which has become incrusted by the evaporation of its watery part during the night. Thus the eyelids are often so firmly agglutinated together, as to require long bathing with warm water before they can be parted. When the Meibomian secretion is renewed, its viscidity is increased, and consequently it assists in gluing the lids together, while its diffusion over the cornea affects its polish, impairs vision, and leads the patient to ask for something to clear it. Hence frequent attempts to clear the cornea by moving the eyelids; and hence, when vision becomes worse in the evening exacerbation of the symptoms, rings, haloes, and irides are seen round the candle, or its flame splits into stars. At the same time, the uneasiness, smarting, or itching, the stiffness, redness, and mucous secretion, are increased. The ciliary margins become raw. The eyelids, particularly towards their angles, and the lower eyelid more especially, are irritated by the nature of the discharge, excoriated, and even ulcerated. This, which is the chronic form of the complaint, and called *lippitudo*, often lasts for many weeks, months, or years; recurring on the application of slight causes, whether external or internal; often originating insensibly, and advancing slowly, without any marked acute stage; leading to thickening of the eyelids, especially of the mucous lining of the lower one, and consequent ectropium of that lid, and loss of the cilia.

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* Synopsis, &c. p. 372.

The causes of this disorder are referred by Mr. Lawrence to atmospherical influence, exposure of the eyes to cold and wet weather; residence in close smoky apartments, and employment of the eye by candlelight, &c. The operation of these causes, he says, is increased by neglect of cleanliness, indulgence in fermented liquors, and inattention to the state of the bowels.

In the acute, or incipient stage, Mr. Lawrence recommends the application of leeches to the eyelids, tepid lotions, mild ointments, and active aperients, and afterwards alteratives and gentle purgatives. The taking of blood from the temples by cupping may sometimes be necessary, and the repetition of leeches is frequently so. Blisters may afterwards be used. The organ must be rested, and the exciting causes removed. In the chronic stage, Mr. Lawrence employs astringents and stimulants, and free scarification of the inside of the eyelid. The vinum opii and metallic salts in solution may be used; but the unguentum hydrargyri nitrati, or the red precipitate ointment, weakened with an equal quantity or two thirds of ung. cetacei, is preferred. It is to be applied with a camel-hair pencil to excoriated edges of the eyelids, which should be previously freed from all incrustations, after they have been duly softened with tepid water.

The disease is sometimes rendered obstinate by complication with a scrophulous constitution, in which circumstance, alterative medicine, the warm bath, the flesh brush, regular exercise, warm clothing, and blisters kept open behind the ears, may be tried.

GRANULAR CONJUNCTIVA,

Is mostly an effect of severe purulent ophthalmy, and consists of a rough, hard, granulated state of the lining of the eyelid, attended with a thin or puriform discharge; a varicose affection of the vessels of the sclerotic conjunctiva; a nebulous appearance of the cornea; a sensation as if sand were lodged under the eyelids; great tenderness of the organ, and inability to bear the light; and an incessant epiphora.

In recent cases, the cure may be obtained by applying leeches to the vicinity of the eye, and putting on the diseased part of the lining of the eyelid, once or twice a day, with a camel-hair pencil, a little of the ung. hydrarg. nitrat. When this application fails, the sulphate of copper, or nitrate of silver, may be applied; and for this purpose, as Mr. Welbank has rightly observed, the eyelids should always be completely everted, as there is sometimes at the angle, where the conjunctiva passes from the globe to the lid, a semilunar fringed fold, not unlike a cock's comb*, which might otherwise not be discovered. After the use of caustics, the part must always be well washed with tepid water, before being returned into its natural position. When the granular productions are hard, callous, and pendulous, some writers prefer excision to caustic.

CONCRETIONS OF THE EYELIDS,

Are of two kinds; one, termed *symblepharon*, in which the lining of one or both eyelids adheres to the eyeball; the other, named *anchyloblepharon*, in which the two eyelids adhere at their edges. The two states frequently exist together.

The last form of the complaint is sometimes, though rarely, an original malformation. It is most frequently produced after birth by violent ophthalmies, burns, &c. When the edges of the eyelids have grown together, the preternatural connexion is to be divided with a bistoury, care being taken not to wound the eyeball. The cut surfaces are then to be kept asunder by the interposition of lint dipped in sweet oil, or by supporting the upper eyelid with a strip of court plaster, until they have healed. When the edges of the eyelids have grown together, from the outer to the inner canthus of the eye, it is of no use to separate them, if the cornea be known to be perfectly opaque. It is only when the adhesions between the eyelids and eyeball are loose, limited to a small extent, and not situated over the cornea, that it is very practicable to do good by an operation.

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* See Frick on Diseases of tke Eye, p. 240, note.

ECTROPIUM.

A turning out of the eyelids is so named. The lower one is most frequently affected, its edge falling downwards and forwards away from the eyeball, which is no longer duly covered and protected.* This exposure of the lower portion of the eye, and of the conjunctiva of the eyelid, produces in these parts a species of chronic inflammation, attended with constant pain, and redness, and thickening of the membrane, which is at length converted into a hard callous substance, lying just under the globe. As the flow of tears towards the inner angle, and through the puncta lachrymalia, is obstructed, they fall over the cheek, which is sometimes excoriated.

One of the most common causes of this disorder is a contraction of the integuments of the eyelid, or neighbouring part of the face, after the cicatrization of burns, ulcers, and wounds.

In this case, dividing the contracted skin will not give permanent relief, as the new granulations will be absorbed, and the usual contraction again follow cicatrization. The difficulty of curing this form of ectropium led Sir W. Adams to cut out a triangular portion of the tarsus, and then unite the divided parts with a suture, by which means the deformity and all its inconveniences were materially lessened. Another plan, which I should generally prefer to this, is the removal of a considerable portion of the thickened lining of the eyelid, with a convex bistoury, and a pair of dissecting forceps. Afterwards, in proportion as the wound heals, the eyelid, with the aid of a compress and bandage, returns to its natural position. Care must be taken not to cut the puncta lachrymalia. The eyelid is drawn inward again by the same principle which caused its eversion, viz. the contraction of the cicatrix.†

Another species of ectropium, mostly met with in old persons, and arising from relaxation and swelling of the conjunctiva, and a fungous thickened state of the lining of the eyelid, if not in a bad degree, may be cured by turning the eyelid completely out, and rubbing the argentum nitratum along its fungous surface, until a slough is produced. The eyelid must be kept everted until the caustic has been washed off the slough, and the part smeared with oil. Applications, calculated to remove the relaxed state of the conjunctiva, and a compress and bandage for the support of the eyelid, will complete the cure. A slight, recent ectropium, caused by purulent ophthalmy, will generally yield to mild astringents. When the lining of the eyelid is quite hard and callous, its excision should be preferred.

TRICHIASIS,

Is of two descriptions; in the first, there is no defect of the eyelid, and the whole grievance depends entirely on the wrong direction in which the eyelashes grow; in the other, the defect lies altogether in the eyelid itself, the margin of which turns towards the eye, so that the cilia rub against the front of this organ, and produce considerable inconvenience. The latter case, which is by far the most common, is termed *entropium*.

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* Plate 2. fig. 4.

† Plate 2. fig. 5.

When the upper eyelid is inverted in the slightest degree, a distressing irritation of the eye is occasioned; but when a large portion of the lid is inverted, the case becomes truly afflicting. The friction of the cilia against the eye is incessant, and from the continual suffering, the patient's health and strength decline. The cornea ulcerates and becomes opaque, and the sight is ultimately destroyed. Nor is this the end of the patient's misery; unless the cornea become thickened and indurated in an extraordinary degree, assuming a white appearance, like that of a macerated ligament, in which case, the patient finds ease in the insensibility of this new-formed substance.

The appearance of the disease, in its inveterate form, is truly disagreeable. The discharge, the copious flow of tears, the excoriation of the cheek, the opacity of the cornea, the villous, granular, or fungous conjunctiva, compose altogether a disgusting sight. The patient carries his head obliquely, and attempts, in the most awkward manner, to direct the pupil towards the objects which he wants to see; indeed, when the upper eyelid is inverted, the patient, in order to avoid turning up the eye, distorts his head, and seems as if he had a wry-neck.*

The usual cause of the distorted position of the cilia is cicatrices near the edges of the eyelids, after strumous ophthalmy, inveterate and neglected cases of psorophthalmia, &c. In consequence of inflammation or ulceration, the hairs fall off, and when they grow again, they shoot in a wrong direction. Trichiasis, if not relieved, generally destroys the sight, for the friction and pressure of the hairs against the eye occasion severe pain, constant inflammation, and, at length, ulcers, and complete opacities of the cornea.

The cure of the first description of trichiasis consists in plucking out the inverted hairs, and preventing their reproduction in the same direction, by smearing the whole inner half of the margin of the eyelid, by means of a camel hair brush, with the liq. ammon.; or a solution of the argentum nitratum; or else by removing a piece of the skin, containing the roots of the inverted cilia, as proposed by Mr. Saunders.

The second kind of case, called entropium, is the most frequent. In the upper eyelid, the defect may be owing to a relaxed state of the levator muscle, or integuments of the part, in which circumstance, it may sometimes be cured by supporting the eyelid, for a certain time, with sticking plaster; but if this plan fails, a cure may generally be accomplished by cutting away a fold of the integuments near the edge of the tarsus. This should be done exactly in the middle of the inverted part, and the best instruments for the purpose are a pair of curved scissors, and the forceps invented by Bartisch. The wound is then to be closed with sticking plaster, compresses, and a bandage.* In proportion as the contraction of the cicatrix follows, the tarsus is restored to its right position.

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* See Saunders's Treatise on some Pract. Points relating to Diseases of the Eye, &c. pp. 45—48.

Another ingenious treatment is that of producing a contraction of the skin of the eyelid, by means of strong sulphuric acid, which is to be applied by means of a piece of smooth solid wood to the centre of the affected part of the lid, and rubbed along on an oval space, a little longer than the extent of the inversion of the hairs, and from three to six lines in width, according to the inveteracy of the disease. After the acid has been applied about ten seconds, the part is to be dried. In general, three or four applications in this manner will bring the hairs into their natural position.†

More difficult cases, however, are met with, arising from an alteration in the shape of the cartilage of the eyelid. For these the common plans will not suffice. In one example of this kind, Dr. Crampton effected a cure by making two perpendicular incisions in the broad margin of the tarsus, at the sides of the inverted hairs, and then making a transverse cut through the lining of the eyelid, from the extremity of one of the first wounds to that of the other. The inverted portion of cartilage, within the incisions, was then put into its right position, and retained so with sticking plaster.‡

In very bad cases in which Mr. Saunders conceived the vicious shape of the tarsus made the restoration of its natural position totally impracticable, he performed its excision; but the operation, which is severe and apt to leave disfigurement, is not in general considered so eligible as that suggested by Crampton.

Other plans of relieving entropium have been proposed; but the preceding seem to be those which deserve notice in an elementary work.

If an inversion of the lower eyelid were to proceed from the orbital edge of the tarsus being pushed out by an encysted tumour, or by a chronic thickening of the conjunctiva, the removal of the tumour, or thickened membrane, and the use of a compress to keep the orbital edge of the tarsus inwards, would effect a cure.

PTOSIS.

This disease consists in an inability of properly raising the upper eyelid. Three varieties are noticed: the first depends on a preternatural elongation of the skin of the upper eyelid; the second, on weakness or total paralysis of the levator muscle; and the third, on a spasmodic contraction of the orbicularis palpebrarum.

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* See Scarpa's Osservaz., &c. sulle Principali Malattie degli Occhi, pp. 76—78. edit. 8vo.

† See Guthrie's Operative Surgery of the Eye, p. 30.

‡ Essay on Entropeon, p. 55.

The first example is the most frequent, and is cured by the removal of the redundant integuments of the eyelid.

The second species is principally met with in old persons, in whom the cure is often impracticable. It is sometimes symptomatic of hydrocephalus, and apoplexy, injuries of the head, chlorosis, worms, &c., while, in other examples, it is entirely a local defect.

The chief means of cure are, bathing the eyelid and forehead with cold water; the shower bath; friction with camphorated mercurial ointment, or liniments strengthened with the tincture of cantharides; electricity; an issue between the mastoid process and angle of the jaw; the exhibition of bark and other tonics. But, in every instance, the cure will depend upon the possibility of removing the original disease, of which the paralysis of the eyelid is an effect.

Ptosis from a spasmodic affection of the orbicularis muscle is the least frequent, is never continual, but makes its attacks at certain or uncertain periods, and its duration varies in different cases.

The spasmodic ptosis is sometimes an effect of epilepsy, hysteria, worms, &c., in which cases, the treatment should be directed to the original complaint. As a general observation, it may be said, that the affection of the eyelid requires aperient medicines, antispasmodics, blisters behind the ears, and bathing the eye with a warm decoction of poppy-heads.

HORDEOLUM, OR STYE,

Is always situated at the edge of the eyelids. It is a very small circumscribed tumour, about the size of a barleycorn. An inflamed stye is extremely red and painful; and is very similar, in every respect, to a small boil.

The cure of an inflamed stye demands the external employment of emollient applications; for the tumour always suppurates, and the more this is promoted, the sooner is the patient freed from inconvenience. Even when the stye has already suppurated, emollients are the best applications, until the hardness has subsided. When the suppuration has terminated, a weak solution of the acetate of lead may be used to disperse the remaining redness and swelling.

The *indurated* stye, as it is called, occasions a good deal of inconvenience, by frequently inflaming and becoming painful, hindering the motion of the eyelids, and preventing the free enjoyment of sight. The best mode of curing this disease is to touch the little induration with the argentum nitratum, until it is destroyed.

ENCYSTED TUMOURS OF THE EYELIDS.

These are most frequently situated immediately under the skin, but sometimes they lie so deeply, that they can be taken out more easily from the inside, than the outside of the part. They seldom become very large, and are more commonly observed on the upper, than the lower eyelid. When they have attained a certain size, they hinder the elevation of the eyelid, and occasion ptosis. They can only be safely extirpated with a cutting instrument.

Scarpa is an advocate for removing the generality of them, by making the incision through the lining of the eyelid, which practice is decidedly right, when the tumour is deep-seated within the eyelid, or beneath the orbicularis and levator muscles. Care must be taken not to cut the tendon of the trochlearis. However, if the tumour be on the outside of the cartilage of the eyelid, the wound should generally be made through the integuments.

CHAP. XI.

OPHTHALMY, OR INFLAMMATION OF THE EYE.*

Of all the disorders of the eye, inflammation is the most frequent; and there are few diseases of this organ, with which it is not sometimes connected either as cause, or effect. It has only been of late years, however, that its various forms have been well discriminated; for ophthalmy was a term applied to all inflammations of the eye, whether the eyelids, the conjunctiva, the sclerotica, the iris, or the retina, were the structure chiefly concerned; and although the epithets *mild* and *severe*, *dry* and *humid*, *external* and *internal*, were frequently used, the more valuable distinctions deducible from the structure principally affected in different examples, and the characteristic symptoms of each variety, were altogether overlooked. As my friend Mr. Lawrence has observed in his excellent lectures, inflammation of the eye generally commences in one structure, to which it is at first restricted, and beyond which, if it be rightly treated, it does not usually extend. But, if it be neglected, or wrongly treated, it soon exceeds its original limits, and, perhaps, ultimately invades the whole organ.

Inflammation of the whole eyeball, or common inflammation, seated both in its external and internal structures, when fully developed, is characterized by very considerable pain, increased external redness, more or less swelling of the whole organ, an augmented secretion from the lachrymal gland, and redness and swelling of the upper eyelid. The pain is not confined to the forepart of the eye, but is deep-seated, and extends to the eyebrow, cheek, temple, and back of the head. In the commencement, the redness is inconsiderable, and chiefly in the vessels of the sclerotic coat; but the conjunctiva very quickly participates in the inflammation, and the distention of its vessels produces the bright scarlet colour, which conceals the fainter pink tint of the sclerotica. The conjunctiva then begins to swell, and a deposition of coagulating lymph (not blood, as is commonly stated) takes place, not only in the texture of the membrane, but in the loose cellular tissue which unites it to the sclerotica: this very red, circular projection, of the conjunctiva round the cornea, giving the latter membrane a sunk appearance, and even sometimes partly concealing it, has long been known under the name of CHEMOSIS. Light is very offensive; so that the pupil contracts to exclude it; and the eyelids are spasmodically closed. As all motion of the organ gives pain, the patient keeps it as much as possible at rest. In the beginning, the organ is rather stiff and dry, but this state goes off, and is succeeded by a copious lachrymal discharge, which is much increased if the eye be exposed to the light, or any external irritation.

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* For some valuable observations in this chapter, I am indebted to Mr. Lawrence's Lectures.

In a more advanced stage, various changes of structure are observable. The colour of the iris is altered, its brilliancy disappears, and its usual motions in different degrees of light are interrupted. The pupil diminishes, and loses its clear black colour. The cornea becomes more or less opaque, and vision is lost, sometimes from this cause, and the closure of the pupil; sometimes from injury of the retina, as when sight is destroyed, though the cornea and pupil do not completely obstruct the light; and, frequently, from all these circumstances together.

Although the internal parts of the eye, generally, cannot be seen to be inflamed, no doubt can be entertained of the fact, when it is considered that the eyeball is actually increased in size, the structure of the iris changed, and the sensibility of the retina lost.

The thickened eyelids protrude; ectropium of the lower one takes place; and a portion of the front of the eye projects, like a piece of red flesh.

So violent an affection of a vascular and sensible organ, situated in the immediate vicinity of the brain, necessarily produces a great deal of constitutional sympathy, or inflammatory fever.

If the case be not checked, the pain becomes throbbing, rigors occur, and suppuration of the eyeball takes place, the cornea assuming first a dull white, and then a yellow colour. No relief is experienced until the cornea bursts, and the collected matter is voided, with which the vitreous humour, and crystalline lens usually escape. The eye then shrinks into the orbit, its original form being completely destroyed. When the disease does not proceed quite so far, the patient escapes with opacity of the cornea, and a closed pupil, vision being either lost, or seriously impaired, but the natural figure of the organ continuing. Even in the most favourable terminations, when the cornea is clear and the pupil open, the retina has generally suffered so much, that vision remains more or less imperfect.

No hope can be entertained of preventing change of structure in

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the organ, and consequent loss of sight, unless the case be actively treated in its early stage.

When chemosis is formed, the cornea cloudy, the colour of the iris changed, and the pupil contracted, the patient is likely to lose his sight.*

Inflammation of the external proper coats of the eye varies considerably in degree, from a slight affection of the conjunctiva to acute inflammation of it, with chemosis, and similar inflammation of the sclerotica and cornea. In simple inflammation of the conjunctiva, there is little pain or inconvenience, and no danger to the organ; but, the firmer textures of the sclerotica yield to distention, only slowly and painfully, and their vessels do not easily recover, so that inflammation is more difficultly subdued; while the implication of the cornea, and the ready transition of inflammation to the iris, expose the organ to serious danger.

Inflammation of the external proper tunics of the eye is attended with outward redness, pain, intolerance of light, increased lachrymal discharge, and more or less febrile disturbance. The external redness begins on the front of the globe, immediately round the cornea, where it forms a red zone, to which numerous vessels tend over the sclerotica from the back of the eyeball. In inflammation of the conjunctiva, the redness begins at the circumference of the organ, its anterior part being comparatively free from it, and the sclerotica retaining its natural white appearance. The discharge is also of a mucous nature. The character of the red tint differs remarkably in the two cases. The vessels distended in sclerotic inflammation, being seen through the conjunctiva, have a dark-red rose or lively carmine appearance †, which forms a striking contrast to the bright scarlet tint of the vessels distended in conjunctival inflammation. The vessels of the sclerotica always follow the motion of the eye, a circumstance peculiarly characteristic: those of the conjunctiva, on the other hand, are capable of being moved without any motion of the eyeball itself.‡ The conjunctiva soon participates in the affection; the cornea looks dull; it is not actually opaque, but its polish is impaired. A stiffness and dryness of the eye, with a sort of burning or aching pain, tension, and pressure; or an uneasiness, similar to what would be produced by sand or gravel in the eye, is felt; and as the disorder increases, the pain grows more severe, and extends to the back of the head, and nearest temple. Intolerance of light is a strongly marked symptom of inflammation of the sclerotica; and forms another striking contrast between this affection and conjunctival inflammation; for, in the latter, the patient generally opens his eye freely, and experiences no pain from the access of light.

In violent cases of inflammation of the outer proper coats of the eye, chemosis takes place, and the cornea loses its bright polished appearance, and turns greyish. The eyelids are also affected, their conjunctival lining becoming red and inflamed. Although the eye feels dry and stiff at the commencement of the case, the lachrymal secretion is soon restored, and even augmented, so that whenever the eye is opened, there is a copious flow of irritating tears.

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* See Lawrence's Lectures on Diseases of the Eye.

† Frick on Diseases of the Eye. New edition, p. 59. Lond. 1826.

‡ R. Welbank, Op. cit. p. 14.

When the disorder becomes still worse, the cornea first turns greyish, and, on the occurrence of chemosis, white, cloudy, and, lastly, yellow, as if pus were deposited in its texture. The yellow substance, however, is not fluid; neither does it make its way to the surface like pus; but the cornea ulcerates, and the deposited matter is removed by ulceration. A similar deposition may take place in the anterior chamber, producing what is termed *hypopium.* When the cornea is affected in this manner generally, the ulceration commonly extends into the anterior chamber at several points; the aqueous humour escapes, and the iris comes in contact with the inflamed and ulcerated cornea, and is often protruded in one or more places. When the inflammation subsides, the cornea is left opaque, the iris adherent to it, the anterior chamber is abolished, and vision irrecoverably destroyed. If matter be deposited only at one point of the cornea, ulceration may be stopped by active treatment, the cornea nearly regain its natural appearance, and vision be restored entirely, or with little defect.

The degree of danger will depend on the state of the cornea; when this is not affected, or but slightly, there is no danger. If there be chemosis, and the cornea be grey, or white, or if a yellow deposition has taken place in its texture, followed by ulceration, &c. sight will be more or less impaired.

Causes of inflammation of the eye.—Wounds, and other kinds of external violence; the irritation of extraneous substances lodged under the eyelids; immoderate exertion of the organ, particularly in viewing minute shining objects, and in hard study by candlelight; exposure of the eye to a glare of light reflected from the sea, or a snowy, sandy, or chalky country; the sudden impression of a flash of lightning; and certain states of the atmosphere. Mechanical and chemical injuries of the eye necessarily produce more or less inflammation in all individuals; but atmospherical influence, a redundance of light, and great exertion of the organ, will not excite the complaint in every person. Besides these latter exciting causes, therefore, some predisposing state of the part or constitution must exist, without which the eye will not be inflamed by them. In the list of predisposing circumstances, writers mention fulness of habit, or plethora; a disordered state of the digestive organs; intemperance, producing an increased circulation, and an augmented distribution of blood to the head and eyes; the cessation of habitual discharges; sedentary occupations; and costiveness.

Treatment.—The first duty is to remove, if possible, the cause of the inflammation of the eye, as may be accomplished when extraneous substances are in contact with the organ. The eye should first be examined in a good light, and, if nothing be discovered on it, the lower eyelid should be depressed, and the inferior portion of the globe brought into view by the patient's looking upward. If no particle of extraneous matter can be detected in this way, the patient should turn the eyeball downward, and the upper eyelid be raised, so that the upper portion of the globe may be seen. In most cases, the extraneous body lodges in the concavity of the upper eyelid, which is then to be everted. The eyelashes are first to be taken hold of, and the eyelid drawn downwards, and while steady pressure is made against its upper part, its ciliary margin is to be carried upwards and backwards. When small particles of metal stick in the cornea, they should be removed with the point of a cataract needle. In bad cases, the eye must remain perfectly at rest in a darkened room; and even in slight ones, reading, writing, &c. should be discontinued, though the eye need not be kept in the dark, or covered up. As soon as the patient can bear a moderate light, without inconvenience, it is an excellent rule to remove all coverings from the eye, except a green shade, and admit every day into his chamber a brighter light; so that he may be habituated, as quickly as possible, to the open day-light; for nothing has a greater tendency to prolong an irritable, weak state of the organ, than keeping it long in a dark situation, and unexposed to the air.

Bleeding is the chief means of subduing the above-described forms of ophthalmic inflammation. The blood should be taken from the arm, and, in severe cases, the quantity taken away should be sufficient to induce faintness, when the disorder will receive an immediate and decided check. This practice is necessary in inflammations affecting the whole eyeball, in those which attack the external proper tunics of both eyes, or are violent in the same tunics of only one of them.

The next most efficacious method of taking away blood, Mr. Lawrence finds to be cupping, either on the back of the neck or temple; which he deems more certain and convenient, than opening the temporal artery or jugular vein. To the latter situation, however, he gives the preference, because some branches of the temporal artery are commonly wounded, from which an adequate quantity can always be readily obtained. In severe cases, the repetition of venesection is sometimes necessary, but cupping still more frequently. Leeches are useful, and may be put either on the eyelids, the temple, eyebrow, or just below the inner commissure. On the eyelids, however, they often produce a kind of ecchymosis, on which account, some practitioners apply them to other parts near the eye. Scarifying the conjunctiva, a plan formerly in common use, is condemned by Mr. Lawrence in every instance of active inflammation, as more likely to do harm than good; a sentiment in which I fully coincide.

In addition to bleeding, every other part of the antiphlogistic system will be requisite, as low diet, and purging with calomel, combined with rhubarb, extract of colocynth, or jalap, or followed by infusion of senna, salts, and manna. Saline medicine, with antimony, or nitre, is afterwards to be given to promote perspiration, and keep the bowels regular.

After evacuations, blisters may be applied to the back of the neck, or behind the ear; but, when the inflammation is active, not nearer to the affected organ; a valuable remark, particularly insisted upon by my friend Dr. Vetch.

With respect to topical applications in acute ophthalmy, their efficacy is certainly inferior to that of bleeding, and the rest of the foregoing measures; but, it is customary to employ them. I am of opinion, however, with my friend Mr. Lawrence, that a poultice is an inconvenient application to the eye, and, perhaps, generally more hurtful by its pressure and its total exclusion of the light and air, than truly useful. In the very acute stage of ophthalmy, therefore, a tepid collyrium, composed of about five grains of the sulphate of zinc, or acetate of lead, dissolved in four or six ounces of rose-water, may be used in an eye-cup; and, if the case be very severe, and attended with violent headache, a strong decoction of poppy-heads may be employed as a fomentation. In proportion as the irritability of the eye diminishes, the warmth of the collyrium should be gradually lessened, until it can be borne quite cold. When the acute form of the complaint has completely subsided, the cure may often be accelerated by introducing between the eye and eyelids, once or twice a day, two or three drops of the vinous tincture of opium. The premature employment of this application, however, while great tenderness of the organ and aversion to light exist, is never advantageous; nor is it in any circumstances superiorly useful to other stimulating fluids of the same degree of strength.

With the view of relieving severe acute ophthalmy, and preventing opacity of the cornea, when the case is attended with a sense of distention in the eye, and cloudiness of the cornea, Mr. Wardrop sometimes makes a small puncture in the anterior chamber, and lets out the aqueous humour; a proceeding which he also recommends when there is the smallest quantity of pus in the same chamber, attended with inflammation. Various opinions are entertained of the usefulness of this practice; but it is certainly one that is not at present very commonly followed. Neither is the treatment with nauseating and purgative doses of tartarized antimony much adopted, a plan so highly commended by Scarpa. When, in severe cases, a yellow substance is effused in the anterior chamber, the quick exhibition of mercury, as well as the continuance of antiphlogistic remedies, is urgently necessary.

When inflammation of the proper coats of the eye has attained its chronic stage, or, according to Mr. Lawrence's view of the subject, when its degree has lessened, the question is, whether an attempt should be made to restore the tone of the organ by astringent applications, tonic medicines, liniments to the eyelids and eyebrow, and the vapour of the spiritus ammon. comp. to the eye itself, assisted with a strengthening diet, good air, and gentle exercise; or whether the continued use of cupping and leeches, and the insertion of a seton in the temple, with a regimen and medicines adapted to the particular state of the constitution, will answer best? This is a point, on which high authorities differ.

Inflammation of the conjunctiva presents itself either in a mild or severe form: the first case is named by Beer, *catarrhal ophthalmy;* the second comprises all the varieties of *purulent ophthalmy*, as it is customarily called in this country. *Catarrhal ophthalmy* generally commences with stiffness and smarting, or a sensation as if sand had got into the eye, some uneasiness on exposure to light, a watery state of the eye, and external redness. When fully developed, it is characterized by redness, increased *mucous*, not *lachrymal*, discharge, inconsiderable pain, and *no intolerance of light.* The redness is superficial, and of a bright scarlet colour, forming a striking contrast to the rose or pink tint which belongs to the inflammation seated in the sclerotica. The distended vessels are quite superficial, and of a scarlet colour. They may be readily pushed aside by moving the eyelids. The redness is generally in patches, the membrane having a mottled appearance; but, in the fullest developement of this affection, the whole surface becomes of a bright red. The redness begins at the circumference of the globe, and gradually advances towards the cornea; but at first it is confined to the palpebral conjunctiva, or to the angle of reflection. In severe cases, little ecchymoses are sometimes seen in the conjunctiva, denoting the activity of the inflammation; and sometimes small vesicles, containing a serous fluid, are formed, usually near the margin of the cornea.

Catarrhal ophthalmy produces much swelling of the conjunctiva, yet nothing like chemosis, the only approach to which is a loose serous effusion, raising the mucous membrane from the sclerotica.

When the lachrymal discharge, observed in the very commencement, stops, its place is supplied by increased secretion of mucus, which is at first thin, but becomes thicker as the inflamed conjunctiva goes through certain stages, assuming a whitish or yellowish appearance, and even resembling pus. Its quantity depends on the degree and extent of the inflammation: it may be just sufficient to collect in small quantity at the corners of the eye; a whitish streak may be seen on the inside of the lower eyelid at the angle of reflection; there may be enough to form more or less copious incrustations about the cilia, and agglutinate the edges of the lids at night; or it may constitute a profuse discharge, hardly distinguishable from that of mild purulent ophthalmy. In every marked case of catarrhal inflammation of the eye, the eyelids are always more or less affected. Whenever the attack is severe, other mucous membranes suffer; hence, pain and sense of weight about the frontal sinuses and antrum; disordered stomach, foul tongue, chills, heat, headache, &c.

According to Mr. Lawrence's further correct description, this species of ophthalmy is distinguished from common inflammation of the external tunics by its catarrhal origin; the diurnal remission, and nocturnal exacerbation of the symptoms; the absence of pain and intolerance of light, even when there is great general redness;

the bright red tint of the membrane and of the distended vessels; and the mucous discharge. From purulent ophthalmy, it is distinguished by its much milder character, and by its not being contagious; if the latter always be so, which, in Mr. Lawrence's opinion, and that of the generality of foreign surgeons, has not yet been proved.

In general, catarrhal ophthalmy readily yields to proper treatment, and is therefore free from danger. If the inflammation be violent, neglected, or badly treated, it may extend to the sclerotica and cornea, causing ulceration and opacity of the latter, and thus seriously injuring the organ. Sometimes it is restricted to the eyelids.

The origin of this complaint is mostly referred to atmospheric causes. Exposure to drafts of air and cold winds, especially in damp, foggy weather, often gives rise to it. Length of exposure, without exercise, is said to favour the action of the cause: hence, soldiers on watch, or in camp, very often suffer. Great changes in the atmosphere from heat to cold, within a short period, bring on catarrhal affections. These vicissitudes are most common in hot climates, where the burning heat of the day is succeeded by a chilly night air, often combined with heavy dews, to which soldiers are frequently exposed by the nature of their duty. A contaminated state of the atmosphere, produced by the hydrosulphuret of ammonia generated in privies, or by the continuance of numerous individuals in one room or building, is a common cause of catarrhal ophthalmy, and accounts for its frequency in barracks, schools, and other crowded institutions. Like other diseases of mucous membranes, it often prevails epidemically in towns, or certain districts; no doubt, in consequence of particular, but unknown, changes in the constitution of the atmosphere. Sometimes it prevails at the same time with an epidemic influenza; and it is alleged, as a remarkable circumstance, that all those persons who are attacked with ophthalmy escape the influenza.*

In catarrhal ophthalmy, mild antiphlogistic treatment will suffice, and it is not necessary to reduce the patient very much, as in some other cases of inflammation of the eye. Venesection may in general be dispensed with, unless the patient be young and of full habit, and the inflammation in both eyes, and severe. In ordinary cases cupping and leeches will be sufficient. The bowels should be freely opened. If the tongue be foul, an emetic may follow the loss of blood. Saline and sudorific medicines may then be given, and the warm bath, or pediluvium, used at night.† But, in very slight cases, nothing more is necessary, after evacuations, than a dry, cool atmosphere, a low regimen, and the frequent application of cold spring-water, or any weak astringent lotion, to the eye. Mr. Lawrence, I observe, gives the preference to warm water, or poppy fomentations. When little febrile excitement is present, Mr. Welbank recommends the early use of astringent collyria, to prevent the formation of vesicles; and mentions one composed of a grain of the extract of belladonna, two or three grains of sulphate of copper, and four ounces of water, as very useful.* In a later stage, when the secretion is thick, and resembles pus, the collyrium may contain lapis divinus, nitrate of silver, alum, or Bates's camphorated lotion. The latter and the vinous tincture of opium were much used by the late Mr. Ware; but though they answer very well, they are not superior to other stimulants of equal strength.

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* Frick on the Diseases of the Eye, p. 26.

† Lawrence's Lectures.

To prevent the agglutination of the eyelids in the night, their edges may be smeared at bed-time with a little spermaceti cerate, or any other simple ointment.

After the inflammation has been lessened by the foregoing means, blisters may be employed, if necessary, which will not often be the case.

The eye need not be covered, unless a strong light should be offensive, when a common green shade may be used.

Purulent ophthalmy is a violent form of inflammation of the conjunctiva, beginning in the linings of the eyelids, and extending to the mucous surface of the eyeball. When severe, and uncontrolled by due treatment, it soon attacks the cornea, which it either completely spoils, or so changes in structure, that vision is either destroyed, or seriously injured. The whole texture of the membrane swells and becomes thicker; its vascular tissue is developed; and its surface acquires an intense bright-red. The mucous surface is rendered villous, pulpy, and granular, like the villous surface of the fœtal stomach, and from the secreting surface, thus produced, the puriform discharge flows. The changes in the cornea are sloughing, ulceration, and interstitial deposition, causing opacity. The sloughing and ulceration often expose the anterior chamber, causing prolapsus of the iris, and may, by letting out the humours, destroy both the function and form of the eye. (*Lawrence.*)

In the progress of the disease, the swelling of the conjunctiva sometimes increases in such a degree, that the upper eyelid cannot be raised, and projects so far, as entirely to cover the lower eyelid. The outside of the upper one becomes red and swelled, and even the cheeks and face.

The disease, from its commencement, is attended with pain, which gradually increases, and is sometimes periodical, coming on generally at night. A little before the puriform discharge is established, a spontaneous bleeding frequently occurs from the eyelids, and is always followed by some mitigation of the symptoms. Occasionally, the conjunctiva, round the cornea, becomes so red and swelled, that it seems like a thick ridge of flesh encircling the latter membrane, which seems sunk in the eye, frequently little more than its centre being visible. If the matter be allowed to lie some time upon the cornea, it may acquire a thick consistence, and so resemble membrane that the inexperienced surgeon may suppose the cornea has suppurated.*

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* Note, Op. cit. p. 27.

Respecting the causes of purulent ophthalmy, I am not aware, that any very useful remarks can be offered in addition to those delivered on the causes of catarrhal ophthalmy. The circumstances, giving rise to the form of it which occurs in infants, are not exactly determined, though a multitude of conjectures may be found in books. The purulent ophthalmy of adults, including the Egyptian ophthalmy, is sometimes imputed to the effects of vivid light and heat reflected from a sandy soil; and to exposure to cold, damp, nocturnal air, after the eye has been unduly stimulated and weakened in the day. With few exceptions, the belief of army surgeons, as well as of the generality of practitioners in England, is, that purulent ophthalmy is infectious; that is to say, capable of being communicated by the application of the discharge to a healthy eye. One form of purulent ophthalmy is supposed to arise either from the suppression of a gonorrhœa, or the inadvertent application of the discharge from the urethra to the eyes; a case, which I shall dismiss from this work, until satisfactory proofs of its reality have been given. Even the believers in its existence represent it as very rare, which could not be, if the causes were such as are conjectured.

In the army, the treatment of purulent ophthalmy has generally commenced with taking away sixty, or seventy ounces of blood from the arm, followed by purgatives, and nauseating doses of tartarized antimony. In private practice, where the generality of patients would not bear the sudden loss of so much blood without great injury of their health, about sixteen ounces may be drawn from the arm by a free orifice, and cupping or leeches employed on the temple. For young children, leeches are the most proper.

When the disease has been neglected, the patient debilitated, and the discharge profuse, bark is generally prescribed; and its extract, or the sulphate of quinine, will be found the most convenient for children. If the cornea be threatened with sloughing, bark is stated to be frequently capable of preventing the evil.

The eye must be washed, every three or four hours, with any weak astringent lotion, injected under the eyelids with a syringe. A drachm of Bates's camphorated lotion in two ounces of water; a weak solution of the sulphate of zinc, common alum, or sulphate of copper, will answer the purpose. Blisters are also to be applied behind the ears, or on the nape of the neck. Afterwards, the local applications may be strengthened; even the undiluted liquor. plumbi acetatis, tincture of opium, and oil of turpentine, have been used with benefit. To prevent the eyelids from adhering together in the night, their edges may be smeared with spermaceti cerate.

Scrophulous inflammation of the conjunctiva, like every other form of scrophula, attacks children more frequently than adults. In its simplest form, it is almost peculiar to children, stationary, marked by a very slight redness of the sclerotic conjunctiva, and the utmost intolerance of light.* By the late Mr. Saunders, pustules of the conjunctiva, aggregated at the margin of the cornea, or appearing separately, or successively at any part of its surface, were deemed a specific character of strumous ophthalmy †, with which the usual marks of a scrofulous constitution were more or less connected. These small pustules are apt to burst, and change into ulcers. The eyelids, particularly the upper, are much swelled and reddened, and generally half closed, on account of the pain always resulting from exposure of the eye to light. The cheeks are irritated by the constant dribbling of the tears over them, and the patient is incessantly rubbing his eye. The pain, caused by the light, renders it difficult to obtain a sight of the affected eye, especially in children. The surgeon should sit down, put the child's head between his knees, and, placing his right forefinger over the orbit, gently raise the skin of the upper eyelid with its point, while the lower one is depressed with the forefinger of the other hand.‡ Although great pain is excited in the eye by light, the disorder at all other periods, is remarkable for being attended with scarcely any pain. When the eye is carefully examined, a diffused and unequal redness is seen, the vessels running in distinct fasciculi towards the cornea, at the circumference of which most of them terminate. However, a few reach even to its centre; and each fasciculus ends in one of the minute pustules already described. In a more advanced stage, the vessels of the conjunctiva pass over the margin of the cornea to its very centre, and the latter membrane itself becomes of a reddish-brown colour, thickened, and much altered in texture. The iris and pupil are thus concealed, and vision seriously interrupted.

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* See Frick on Diseases of the Eye, pp. 40—42.

The causes of strumous ophthalmy were referred by Mr. Saunders to bad air, improper food, and cold. Mr. Travers regards the disease as intimately connected with a disordered state of the secreting surfaces of the alimentary canal and skin. § Probably, whatever would bring on catarrhal inflammation of the eyes in a healthy person, would produce this variety in a scrophulous constitution. In the treatment of strumous ophthalmy, rigorous antiphlogistic measures are never necessary. The secretions of the alimentary canal and skin, however, should be restored, for which purpose Dr. Frick recommends the liquor. ammon. acet., combined with vinum antimonii, to which may be added a small quantity of syrup of poppies, when it is to be given to children. The pulv. ipecacuanhæ comp., and calomel with opium, are also described as fit medicines. The eye should be protected from the light with a green shade, or by darkening the room. The intolerance of light would only be aggravated by bandages; but a blister, kept open on the nape of the neck diminishes it with great effect. If the cornea be opaque, calomel, or the blue pill, or the oxymuriate of mercury, with opium, should be given so as slightly to affect the system.* The state of the general health, and that of the eye which is dependent on it, may sometimes be improved by bark, joined with the tinct. guaiaci ammon. (*Scarpa*) In every instance, a pure air, cleanliness, and a light nutritious diet, are of essential service. The sea-air, and the regular use of a flesh-brush, often do much good. When ulcers are present, a solution of nitrate of silver, (two grains to an ounce of distilled water) may be injected on them. (*Saunders.*) When the disease is accompanied with violent contractions of the orbicular muscle, fumigations of laudanum in boiling water will afford great relief. For the prevention of a relapse, an issue, kept open in the nape of the neck †, or arm, is one of the most effectual plans.

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* Travers's Synopsis, &c. p. 92.
† On Diseases of the Eye, p. 99.
‡ Frick on Diseases of the Eye, with notes, by R. Welbank, p. 50.
§ Synopsis, p. 95.

CHAP. XII.

IRITIS.

Although this subject might have been classed with other inflammations of the eye, and treated of in the preceding chapter, I think its importance well entitles it to separate consideration. Next to the conjunctiva, the iris is that texture of the eye, which is most frequently affected with inflammation

The iris often becomes inflamed, in consequence of surgical or accidental wounds of the eyeball; it may indeed arise from various external causes; or it may originate from some peculiar diathesis of the whole system. Thus one species of iritis, having a very distinct character, is produced by the venereal disease, especially that form of it, which is described by Mr. Carmichael under the name of the *papular venereal disease.* Sometimes inflammation extends to the iris from other textures of the eye. The iris constitutes the principal seat of inflammation in the distinct kind of ophthalmy, frequently met with in gouty constitutions, In rheumatic ophthalmy, the inflammation, though never originating in the iris, frequently extends to it.

Scarcely any disease to which the eye is subject, has a more immediate or rapid tendency to destroy vision, than inflammation of the iris. In *idiopathic iritis,* (as Professor Schmidt observes,) besides the common symptoms of ophthalmia, certain changes happen at the very commencement, indicating the seat of inflammation. The pupil appears contracted, the motions of the iris are less free, its brilliancy fades, and the pupil loses its natural bright black colour. The iris becomes thickened and puckered, with its inner margin turned towards the crystalline lens. The change of colour happens first in the lesser circle of the iris, which becomes of a darker hue; and afterwards in the greater circle, which turns green, if it had been greyish or blue; and reddish, if it had been brown or black. The redness accompanying these changes is by no means considerable, and is at first confined to the sclerotic coat, in which a number of very minute rose-red vessels are seen running in straight lines towards the cornea. In the words of Mr. Saunders, the vascularity of the sclerotica is very great, whilst that of the conjunctiva remains much as usual, the plexus of vessels lying within the latter tunic. The inosculations of these vessels are numerous, and form a rose-coloured zone at the conjunction of the sclerotica and cornea. Here the vessels disappear, not being continued over the transparent cornea, as in a case of simple ophthalmy, but penetrating the sclerotica, in order to pass to the inflamed iris. The red zone, here mentioned, has been deemed a certain mark of iritis; but, this is a mistake, since it also presents itself in strumous ophthalmy. The irritation caused by the light is distressing, and the patient is much incommoded by any pressure on the globe of the eye, or by the rapid or sudden motions of this organ. Considerable uneasiness is felt over the eyebrow, and acute lancinating pains shoot through the orbit towards the brain. The pupil loses its circular form, becomes somewhat irregular, and presents a greyish appearance. Examined with a magnifying glass, this appearance is found to be produced by a substance very like a cobweb occupying the pupil, and which can soon afterwards be distinguished, even without the aid of the glass, to be a delicate flake of coagulable lymph. Into this, says Professor Schmidt, the processes or dentations of the irregular pupillary margin of the iris seem to shoot, and it is afterwards found that adhesions are apt to be established at these points. Owing to these adhesions, the patient, whose vision has been all along indistinct, is now able to see only one side or part of an object. While these changes are taking place in the posterior chamber, others equally remarkable are occurring in the anterior. The iris projects more and more towards the cornea; a small orange-coloured tubercle now forms upon its surface, gradually enlarges, and is full of a purulent fluid. At length it bursts, and discharges its contents into the anterior chamber, so as to produce the case termed *hypopium.* If more than one tubercle be present, the whole anterior chamber may be filled with pus, and the iris be completely hidden.

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* Travers's Synopsis, p. 259.

† Welbank, in his edit. of Dr. Frick's Work, p. 35.

According to Mr. Travers, when the inflammation commences in the iris, and is not propagated to it secondarily, the conjunctiva is less reddened, and consequently the vascular zone is plainer.*

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* Synopsis, p. 133.

When iritis is not subdued by efficient treatment, the consequences may be a more or less complete closure of the pupil, with opacity of the capsule of the lens; adhesion of the iris to the cornea, with more or less opacity of the latter; and even an amaurotic affection of the retina. Schmidt, Beer, and many English surgeons believe, that the iris is subject to an inflammation, which is as characteristic of the presence of syphilis in the constitution, as any other secondary symptom. As, however, this iritis frequently comes on in persons while they are actually under the influence of mercury, or after they have used it profusely for papular eruptions, pains in the large joints, and other anomalous diseases, often confounded with syphilis, it is sometimes regarded, (and as I conceive justly) not as an effect of true syphilis, but rather as a pseudo-syphilitic affection. A pale redness all round the cornea is the first symptom perceived in the *syphilitic iritis:* this is at first seated in the sclerotic coat alone, but the conjunctiva very soon shares in it, and afterwards becomes the redder of the two. However few the vessels may be elsewhere, there is always a broad zone of them all round the cornea. The redness has a peculiar tint, being brownish, something like the colour of cinnamon.* From this zone, the vessels have a disposition to extend under the edge of the cornea. The whole of this last membrane now becomes uniformly hazy, losing its clearness, without being in any place actually untransparent. The pupil becomes contracted, and the iris limited in its motions, as in common iritis, but the pupil, instead of preserving its natural situation, is removed in a direction upwards and inwards towards the root of the nose, and is irregular. The iris also loses its natural colour, and projects forwards. An aggravation in the symptoms always takes place towards evening, the intolerance of light, and painful sensibility of the whole eye increasing, and a gush of tears following every change of light and temperature. At length a regular nightly pain begins, which is extremely severe, and strictly limited to that part of the cranium which is immediately over the eyebrow. It usually comes on between six and seven in the evening, gradually increases, reaches its utmost height about midnight, and then diminishes till about four or five in the morning, when it ceases. After every such attack of pain, the pupil is found more contracted, drawn farther upwards and inwards, the iris being at the same time more altered both in colour and form, the quantity of lymph increased, and consequently vision more impeded.

Peculiar appearances then take place in the iris, for either on its pupillary, or ciliary margin, or on both, there arise one or more reddish-brown tubercles, which have a spongy look. Their growth is pretty rapid. Lardy-looking ulcers also sometimes appear on the cornea and white of the eye, or on the integuments of the eyelids. Even when syphilitic iritis terminates in the most favorable manner, the eye for a long time afterwards is peculiarly sensible to the influence of cold and moisture. On every exposure to them, the organ becomes morbidly sensible to light, exhibits a slight blush of red, and discharges tears. Indeed, frequently for more than a year afterwards, on every sudden change of temperature, a pale violet-coloured zone appears around the cornea, but goes off when the eye has remained for some time in an equal temperature.*

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* The conjunctiva and sclerotica "have a brick-dust or dusky red, instead of a bright scarlet hue, and the lymph is compact and brown, and intimately adhering to the iris, instead of curd-like, loose, and of a yellowish white colour." Travers in Surg. Essays, part i. p. 69.

The principal danger in iritis depends upon the effusion of lymph, its quick organization, the rapid formation of adhesions between the iris and other parts, and the closure and obstruction of the pupil. Of late years, great improvement has been made in the treatment of this disease; an improvement, derived from a knowledge of the fact, that mercury is one of the most effectual means of stopping the effusion, and promoting the absorption, of lymph in the adhesive inflammation. †

In the idiopathic iritis, before lymph is effused, copious bleeding from the veins of the arm, quickly followed by cupping on the temple, or the application of leeches near the eye, cathartics, and nauseating doses of tartarized antimony, with a view of enfeebling the pulse, are the means from which most benefit may be expected. In many cases, it is even necessary to repeat the topical bleeding several times. As soon as bleeding has been practised, the extract of belladonna should be used for the purpose of resisting the tendency of the iris to contract, and become adherent to the capsule of the lens. I know that some judicious surgeons consider the early application of belladonna objectionable, as tending to increase the inflammation; but, if smeared on the eyebrow, and not applied to the eye itself, it will not have the effect which has been apprehended. If the inflammation is not immediately relieved by these means, mercury should be employed without delay. As a critical writer justly observes, it is not sufficient in this disease to be satisfied with relieving symptoms as they occur; if we are so, the only opportunity of acting with effect will be lost. If we wait till coagulable lymph is formed, it may become so organized before the mercurial action can be excited, as to resist all subsequent remedial measures. ‡

At all events, when the effusion of lymph begins, every possible means must be adopted for resisting this process, and bringing about the absorption of the substance already deposited in the posterior chamber, in the pupil, or upon the iris. Mercury must be freely exhibited, in order to affect the constitution as soon as possible. The ointment, or the pil. hydrarg. with opium, may be employed, and sometimes both together. In this second stage of iritis, Beer used to prescribe calomel united with opium, and a collyrium containing oxymuriate of mercury, mucilage, and a considerable quantity of vinum opii; and when this lost its effect, he introduced daily between the eyelids a small quantity of a salve, composed of two drachms of fresh butter, six grains of red precipitate, and eight grains of extract of opium. He observes also, that frictions once a day, over the eyebrow with mercurial ointment, containing opium, will materially assist in producing an absorption of the effused lymph.*

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* See Quarterly Journal of Foreign Medicine, vol. i., where may be found Schmidt's description of two other forms of iritis, viz. the *Gouty* and *Rheumatic.*

† See Dr. Farre's Letter in the Surgical Essays, by Sir A. Cooper and Mr. Travers.

‡ See Anderson's Quarterly Journ. vol. iii. p. 13.

In the early stage of this form of iritis, fomenting the eye, and darkening the patient's room, will sometimes mitigate the violence of the pain; but, cold applications are never serviceable. (Schmidt.) They were sometimes used, however, by the late Mr. Saunders. According to Schmidt, when blisters are used in the early stage, the best situation for them is the nape of the neck.

In the case regarded by authors as syphilitic, general bleeding is not considered always so indispensable as in idiopathic iritis; yet, it may frequently be practised with advantage; cupping on the temple, leeches on the eyebrow, and purgatives are constantly requisite. The nightly attacks of pain, which are so invariably followed by an aggravation of all the symptoms, are to be prevented by rubbing well into the part over the eyebrow a small quantity of mercurial ointment with opium, a short time before the pain is expected to come on, and then covering the eye with a folded piece of warm linen. This plan is to be repeated, when the pain threatens to come on about midnight. In conjunction with these means, mercury must be employed, so as to affect the constitution, either in the form of ointment, or of calomel pills with opium, which last must be taken two or three times a day.

The form of iritis, preceded by, or accompanying papular and other eruptions not truly syphilitic, also requires for its cure a combination of the depleting with the mercurial plan. In this form of the venereal disease, termed by Mr. Carmichael †, on account of the nature of the eruption, *papular*, iritis will frequently occur, whether little mercury, or none at all, has been employed, and consequently its origin cannot be rightly imputed to this medicine. It is true, that it also comes on after debilitating courses of mercury, injudiciously persisted in for the removal of anomalous eruptions and pains in the large joints, &c.; but, mercury is not properly the cause of it. All that can be said is, that it does not prevent its attack; neither does it hinder the papular eruption from taking place, however early it be employed. Two facts, completely established, at all events are strongly against the idea, that iritis proceeds from the abuse of mercury; the first is, that iritis never takes place in cases where mercury is prescribed, long and copiously, for the relief of disease of the liver, or other complaints, decidedly neither syphilitic, nor pseudo-syphilitic. The second is, that mercury is one of the best means of preventing the irremediable consequences of iritis; a circumstance which cannot be reconciled with the preceding hypothesis.

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* Lehre von den Augenkrankheiten, b. i. p. 450. Wien. 1813.

† See Carmichael on Venereal Diseases, p. 137. 8vo. Lond. 1825.

CHAP. XIII.

CLOSURE OF THE PUPIL

Is most frequently the consequence of inflammation of the internal membranes of the eye, especially the iris. Sometimes, it follows operations for the removal of cataracts. After an indeterminate time from the operation, the pupil is perceived daily to diminish in diameter, without any marked inflammation within the eye, and closes so much, that it can hardly admit a pin's head. The iris is motionless, assumes a radiated rugose appearance, and, when no opacity exists behind it, a little black speck is seen in its centre. In this state, if the retina be sound, the patient may sometimes regain a considerable power of vision, by the formation of an artificial pupil.

The many different modifications of the operation may all be referred to three principal methods; the first is a simple cut through the iris, without the removal of any portion of it. (Coretomia.) The second is an incision in the iris, and the removal of a part of it. (Corectomia.) The third consists in separating some of its external ring from the ciliary ligament. (Coredialysis.)

The first method may be executed with Sir William Adams's iris-knife, or a couching needle, that has a sharp edge only on one side: the needle is to be introduced through the sclerotica, about a line and a half from the cornea, and after perforating the iris, towards the external angle, its point is to be conducted transversely through the anterior chamber, as far as the margin of the iris next the nose: then the sharp edge is to be turned backward, and withdrawn, so as to make a transverse division of the iris. Cheselden, who first ventured to form an artificial pupil, passed the needle into the posterior chamber as far as the nasal edge of the iris, when he thrust it from behind forwards through the iris, and cut this membrane transversely from its internal to its external edge. At a subsequent period, Janin tried the plan of opening the cornea, as is done in the extraction of the cataract, and then divided the iris with scissars, from below upwards, near the pupil, on the side next the nose.

In consequence of the tendency of the new opening to close again, these methods have very frequently failed. With the view of lessening the chance of a closure of the new pupil, Maunoir made a double incision in the shape of the letter V. An incision is made in the cornea, at its lower, or lateral segment, as circumstances may require, and about half as extensive as that usually made for the extraction of the crystalline lens. The surgeon is then to use a pair of very fine scissars *, the upper blade of which is probe-pointed, while the lower one has a point as sharp as that of a lancet. Through the small opening in the cornea, the scissars are introduced shut, with the flat part in a line parallel to the transverse diameter of the iris, and as soon as the point of the instrument has nearly reached the great margin of the iris, nearly opposite the incision in the cornea, it is gently opened, and turned in such a manner that the point of the lower blade may perforate the iris, and pass over its posterior surface, until the other probe-point has reached the part where the cornea and sclerotica join. The iris is then to be cut transversely, by a single stroke, as nearly as possible in its centre. Another incision is then to be made, diverging from the first, so that the two cuts may produce in the middle of the iris a triangular flap, shaped like the letter V, with the apex exactly in the centre of the iris, and the base near its great margin. Five or six days afterwards, the apex is found retracted towards the base, leaving a square, or crescentic opening in the middle of the iris.

Baron Wenzel first practised the excision of a portion of the iris. He introduced the point of the cornea knife into the anterior chamber, exactly in the same manner as in the extraction of the cataract, but when it had arrived nearly as far as the centre of the iris, it was plunged into this membrane, and then, by a slight motion of the hand backward, it was brought out again, about three quarters of a line from the part in which it entered. Next, the incision of the cornea was finished as in cases of cataract, the section of the iris being thus completed first, and presenting a small flap, which was cut off with scissars. The modes of cutting out a piece of the iris are very numerous. Guerin, after the incision in the cornea, made a crucial division of the iris, and then cut off the four angles with scissars.

Beer used to open the cornea, draw out the iris by means of a fine hook, and snip off a small portion of it.

Gibson made a puncture in the cornea, with a broad cornea knife, within a line of the sclerotica, to the extent of about three lines. All pressure was then removed from the eyeball, and the cornea knife gently withdrawn. The consequence of this was, that a portion of the aqueous humour escaped, and the iris fell into contact with the opening in the cornea, and closed it like a valve.

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* See Plate 3. fig. 1 and 2.

Plate 3.

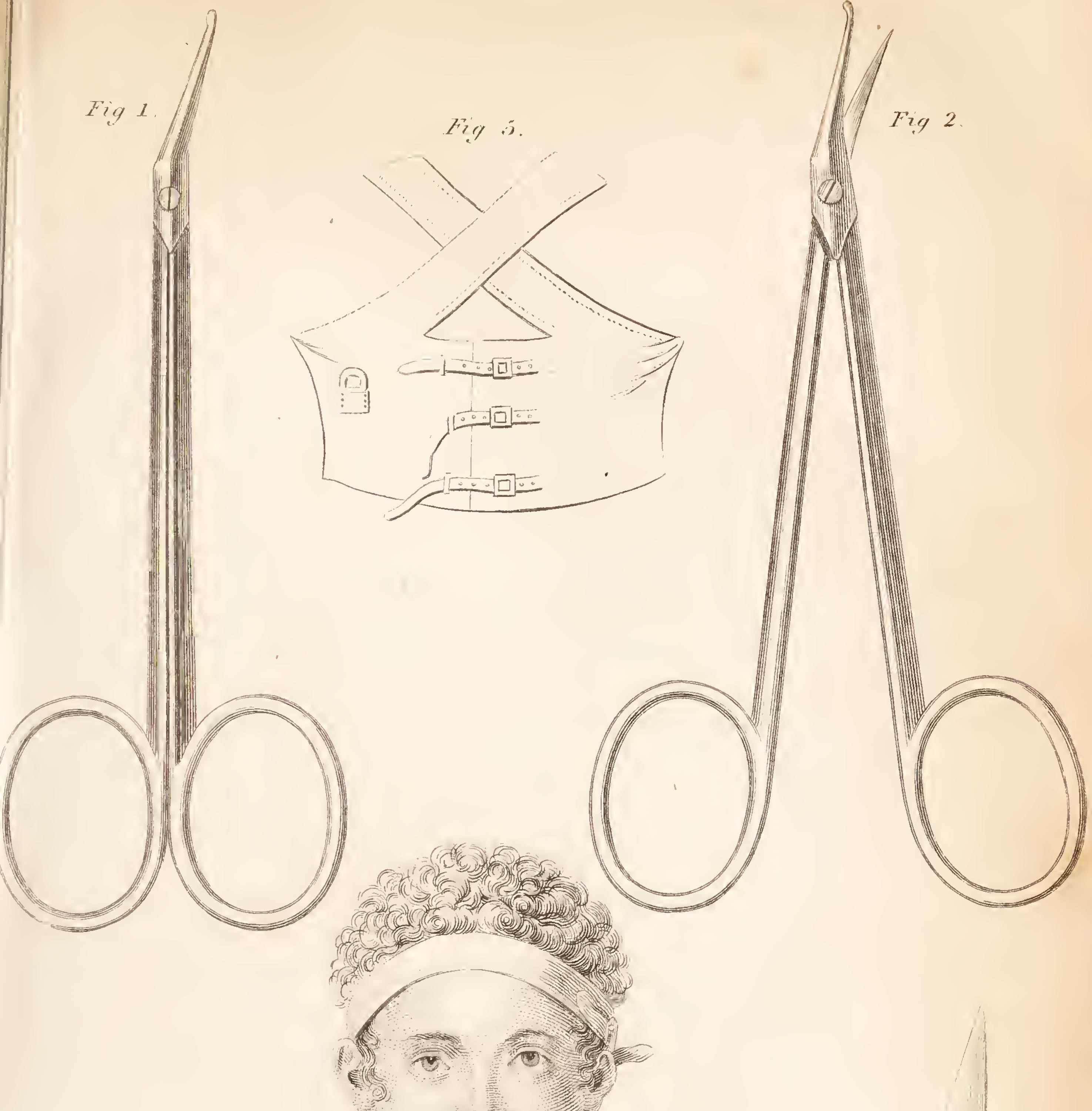

Fig 1.
Fig 5.
Fig 2.
Fig 6.
Fig 3
Fig 4

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A slight pressure was now made upon the upper and inner part of the eyeball, and gently increased or varied in direction, till the iris gradually protruded, so as to present a bag equal in size to a large pin's head. This protruded portion was cut off with a pair of fine curved scissars, and all pressure immediately discontinued. The iris receded into the eye, and the piece that had been removed left an artificial pupil, more or less circular.

The operation of detaching a portion of the circumference of the iris from the ciliary ligament (Coredialysis), is also done by various processes. Scarpa used to effect it with a couching needle, on the side nearest the nose; but, as the new opening was found to diminish in time, so considerably as to become useless, he abandoned this method, and recommended, instead of it, Maunoir's operation. Schmidt and Assalini's modes consisted in opening the cornea, near the place intended for the artificial pupil, seizing the iris with a fine hook, or very small dentated forceps, and tearing a portion of it from the ciliary ligament. The method invented by Reisinger, has the merit of great ingenuity, and, what is equally important, Professor Beer renounced his own plan in favour of it. In the operation, a very fine double hook * is used, which, by slight pressure of the finger and thumb, is made to resemble a single one. A puncture one and a half, or at most two lines in length, is first made in the cornea, near its margin, with a lancet-shaped knife, and, if possible, one quarter of an inch from the part of the iris which is to be separated. The double-hooked forceps closed, is now to be introduced into the puncture, and conveyed, with the points of the hooks turned downwards, as far as the spot where the iris is to be separated, but always as near as possible to its ciliary edge. The points of the hooks are then to be directed towards the iris, and the blades, slightly opened, are to be made to enter the iris. The forceps are now to be shut, and drawn towards the wound in the cornea. Thus a considerable portion of the iris will be detached, brought through the wound, and left to unite with the cicatrix. When the iris cannot be prevented from shrinking into the eye again, the part of it drawn out is to be cut off, the operation being then a combination of coredialysis with corectomia. When the iris is very tense, no prolapsus need be formed, as a free separation, effected with the double forceps, will leave a permanent opening of sufficient size.

A full detail of the circumstances, by which the choice of the particular method of operating ought to be determined, forms too long a subject for present consideration. A few general directions are all that can be given.

Coretomia, or a simple incision in the iris is proper, *when this membrane has a very tense appearance, and when there is no crystalline lens behind it,* as when the closure of the pupil has followed an operation for the removal of cataract. When the capsule of the lens remains, and is firmly adherent to the iris, the latter sometimes cannot be divided with a knife, or sharp-edged needle, as it would sooner give way at the ciliary ligament. In this case, the operation must either be done with Maunoir's scissars, or a separation at the ciliary ligament be preferred, as advised by Mr. Guthrie; because "the formation of a triangular opening with the scissars would not be easily accomplished to a sufficient extent, and the simple division of the central part of the iris would, in general, be ineffectual, in consequence of the thickened capsule preventing the necessary retraction of the fibres of the iris."*

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* See Plate 5. fig. 1.

When the case is an indelible central opacity of the cornea, preventing, or seriously interrupting the entrance of the rays of light to the retina, while the iris, crystalline lens, and its capsule are healthy, and the pupil natural, the right operation is corectomia, or the excision of a piece of the iris, first made to protrude through an opening in the cornea. The other methods would not here be eligible for several reasons, only one of which need be specified, namely, they could not be executed without disturbing the healthy lens and its capsule, the consequence of which would be the loss of their transparency.

When the pupil is contracted, when the iris is adherent to the lens or its capsule, when flakes of organized lymph contribute to the interruption of sight, and the motion of the iris appears prevented by its attachment, the indications are to break this connexion, and to remove the opaque matter. Here, if the adhesion can be overcome with the needle, and the pupil seems large enough, the iris need not be cut at all, no process, analogous either to coretomia, corectomia, or coredialysis, being applicable. After the adhesion has been broken, the texture of the lens is to be opened with the needle, the passage of which behind the iris would otherwise be inevitably followed by a cataract. The belladonna is to be applied immediately after the operation, in order to dilate the pupil, and keep it away from the parts behind it, in which state it must be retained until the lens is dissolved. If after the iris has been detached, the natural pupil should seem too small, the point of the needle must be conducted forwards through the pupil, and the inner edge of the iris divided.†

When the pupil is still more contracted, and there is reason to believe the adhesion of a very firm kind, Mr. Guthrie approves *of corectomia, or a free transverse division of the iris* with a sharp edged needle, or iris-scalpel, performed nearly in the manner directed by Sir Wm. Adams. *The lens is then to be divided in every direction, and, if possible, the fragments pushed into the anterior chamber.* Frequently, the reduction of the lens to fragments will require a second operation.

When there is a central opacity of the cornea, combined with a constricted pupil, and a cataract, Mr. Travers prefers corectomia on the side towards the nose, and the extraction of the lens through

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[*] Operative Surgery of the Eye, p. 466.

[†] Ibid. p. 470.

the new opening, which, if it should seem too small, is then to be enlarged by snipping off the flap of the iris. In the same kind of case, some practitioners prefer Reisinger's combination of coredialysis and corectomia, and removing the cataract by a subsequent operation; while others adopt coretomia, break the cataract to pieces, and push the fragments into the anterior chamber.

When the pupil is closed, and the iris is partially adherent to the opaque cornea, corectomia, that is to say, the removal of a portion of the fixed iris, after hooking it through a limited section of the cornea, is *frequently preferred.* Mr. Travers, however, gives the preference to coretomia, making an extensive vertical, or oblique division of the fibres of the iris, with the iris-knife, or Maunoir's scissars, except when the opacity of the cornea is too extensive for an incision, in which case Scarpa's coredialysis is recommended.* Were the adhesion slight, and the opacity trivial, the proper size, shape, and position of the natural pupil, might sometimes be restored by simply breaking, or cutting the attachment, and then hindering its formation again by keeping the pupil moderately dilated by means of belladonna.

I shall conclude with a few general instructions.

When circumstances permit, a sound part of the iris should always be preferred for the place of the new pupil to an unhealthy portion of it.

When the sight of one eye is entirely lost, and some degree of vision is yet enjoyed through a partially closed pupil of the other eye, an operation for the improvement of the latter is unjustifiable, as its failure would consign the poor patient to complete blindness.

When one eye is perfectly sound, the operation is condemned, as not improving the patient's powers of vision.

A tremulous state of the iris, an extensive opacity of the cornea, and a gouty, scrophulous, or rheumatic constitution, are highly unfavourable to the success of an operation. When the retina is diseased, the eye either larger or smaller than natural, or its consistence and shape changed, the operation can do no good, and of course should not be attempted.

When the new pupil cannot be made in the centre of the iris, the following places are the most advantageous in the order here specified. First, the inferior part of the iris, inclining inwards. Secondly, the internal, a little below the transverse diameter of the eye. Thirdly, the inferior and external part; the upper being the least eligible, on account of the corresponding portion of the cornea being covered by the cornea.*

Many attempts to improve vision, by the formation of artificial pupils, terminate in complete blindness, owing to the neglect of means calculated to lessen the inflammation, necessarily produced within the organ by the operations themselves. In fact, the same kind of treatment is here frequently requisite, as in iritis.

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* Synopsis of the Diseases of the Eye, p. 342.

† See Guthrie's Operative Surgery of the Eye, p. 442.

CHAP. XIV.

PROLAPSUS OF THE IRIS.

Sometimes, when the aqueous humour escapes through an ulcer, or wound of the cornea, a portion of the iris protrudes through the same opening, being generally of a brown or greyish colour, and surrounded, at its base, by an opaque circle of the cornea. It is frequently called *staphyloma iridis*, and its size varies from that of a pin's head to that of a small pea.

The inconveniences produced are, a pricking pain in the eye; an oppressive sense of tightness in the whole eyeball; inflammation of the conjunctiva and eyelids; a copious effusion of tears; and an absolute inability to endure the light. The pupil deviates from the centre of the iris, towards the seat of the prolapsus, and assumes an oval shape. In old cases, the protruded portion of the iris frequently becomes less sensible, and the acute distress, attending the earlier stages of the disease, subsides.

In the early stage, some recommend and endeavour to replace the iris with a small probe. In the case of a wound of the cornea, perfectly recent, where the prolapsus itself is not adherent, the rightness of such practice cannot be doubted. Under other circumstances, the attempt is generally considered useless and likely to do harm.

In general, the best method is to touch the projecting portion of the iris with argentum nitratum, so as to form an eschar. The patient experiences acute pain during the operation; but it soon subsides, when the eye has been bathed with warm milk. The consequent relief only lasts while the eschar remains adherent, and when this is detached two or three days afterwards, the above-mentioned complaints are experienced again, though in a milder degree. The caustic is now to be repeated, and even used, if necessary, a third and fourth time, until the prominent part of the iris is sufficiently reduced to a level with the edges of the wound, or ulcer of the cornea, to create no obstacle to cicatrization. Then the surgeon is to direct a collyrium containing zinc, and the ung. hydrarg. nitrat. (lowered) is to be smeared over the inner surface of the eyelids, every morning and evening. When the prolapsus is large, the projection of the iris may be cut off with scissars. By these proceedings, it is clear, that the deformity of the pupil is not remedied: however, all the annoyance of the disease is removed, and sometimes even the shape of the pupil afterwards gradually improves.

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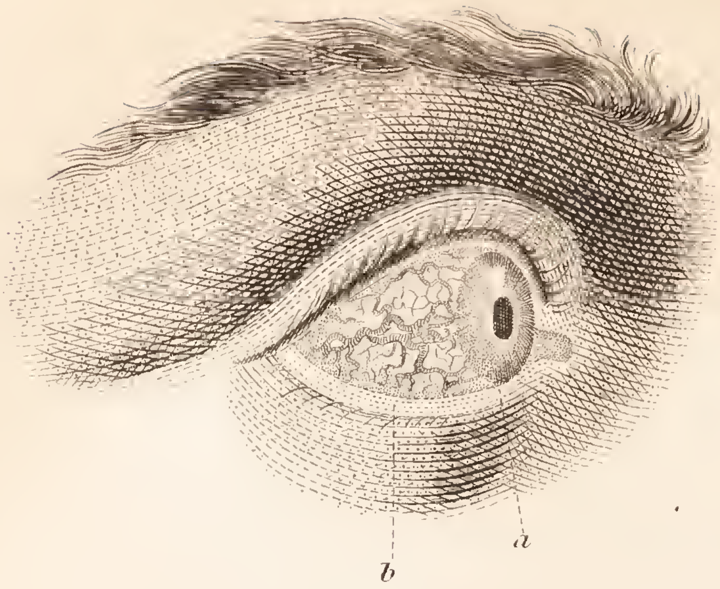

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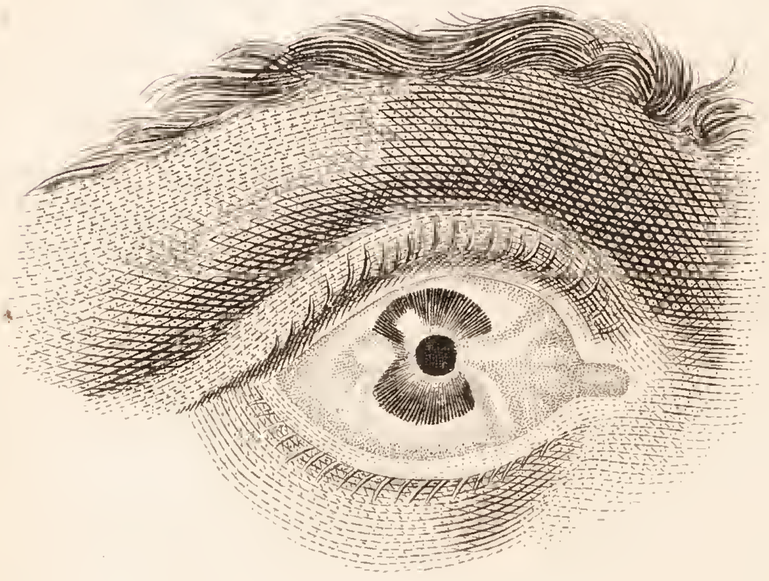

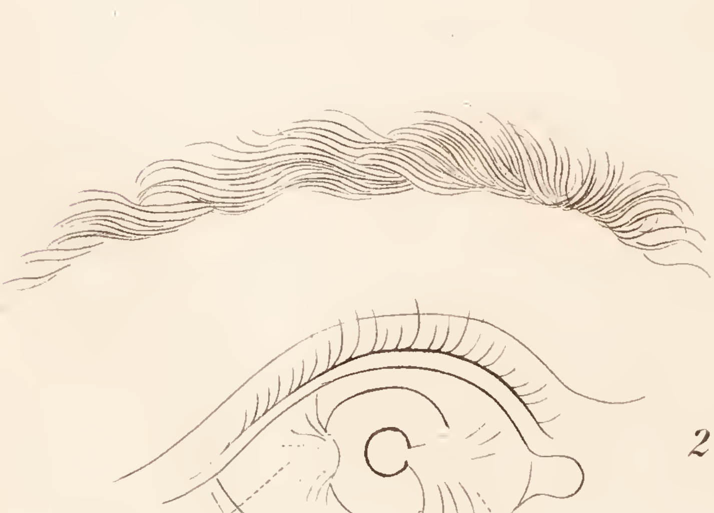

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CHAP. XV.

DISEASES OF THE CORNEA.

Opacities. Recent and superficial opacities should not be confounded with albugo and leucoma, which are of a clear pearl colour, affect the very substance of the cornea, and arise from severe acute ophthalmy, ulcers, or wounds of the part.

In the nebula, or slight opacity, the cornea presents a diffused cloudiness, that has no distinct boundary, but loses itself in the surrounding transparent portion of that membrane. The iris and pupil can be seen through a kind of dimness; and, of course, the patient is not entirely bereft of vision. The veins of the conjunctiva, greatly relaxed by the protracted duration of chronic ophthalmy, become preternaturally turgid, irregular, and knotty; first in their trunks; then, in their ramifications, near the union of the cornea with the sclerotica *; and, ultimately, in their minute branches, returning from the delicate layer of the conjunctiva, spread over the anterior surface of the cornea. When this happens, a milky albuminous secretion begins to be superficially effused in the interspaces between the red streaks.

In the early stage of nebula, active measures are necessary; for, though it may at first only occupy a small portion of the cornea, if left to itself, it will continue to extend towards the centre of this membrane; and as the veins become more and more varicose, it will convert the delicate layer of the conjunctiva, spread over the cornea, into a dense, opaque film.

The indications are, to remove the varicose state of the vessels; and, if that be impracticable, to cut off all communication between the trunks of the most prominent varicose veins of the conjunctiva, and those on the cornea. The first plan is executed by using Janin's ointment, or the ung. hydrarg. nitrat., together with astringent collyria. The second is accomplished by the excision of the fasciculus of varicose veins, at the base of the opacity. But in many cases, besides these indications, there is another, though not mentioned by Scarpa, viz. the removal of the particular cause keeping up chronic inflammation of the conjunctiva. Thus, when its cure is owing to the granular, callous thickening of the lining of the eyelid, the cure of the latter affection is the most important step to that of the nebulous state of the cornea.

Albugo and *Leucoma* consist of a deep extravasation of dense lymph in the substance of the cornea, and arise as consequences of severe ophthalmy, especially what is called purulent, or of an ulcer, or wound of the cornea. The case, arising from the extravasation of lymph in violent ophthalmy, is named albugo; while the term leucoma is particularly applied to the white or pearl-coloured opacity resulting from a cicatrix.

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* See Plate 4. fig. 1. A, the nebula; B, dilated vessels.

A recent albugo may sometimes be dispersed by the same treatment, as is applicable to severe acute ophthalmy, viz. at first, general and topical bleedings, internal antiphlogistic remedies, and topical emollients; in the second stage, astringent, and moderately stimulating applications. However, when the action of the absorbents in the part has been, as it were, deadened, and the texture of the cornea is disorganized, nothing will avail. In recent cases, as soon as the inflammation of the eye has been subdued, the unguent. hydrarg. nitr. may be applied to the opacity, with a camel-hair pencil. The eye may also be frequently washed with a collyrium, composed of two scruples of muriate of ammonia, and four grains of verdigrease, dissolved in eight ounces of lime water: the mixture is to stand twenty-four hours, and then be filtered.

In the true leucoma, arising from a cicatrix, the transparency of the cornea cannot be restored. Like every other scar, however, it becomes considerably smaller than the ulcer, or wound, of which it is the effect.

Ulcers of the Cornea are frequently the consequence of the rupture of a small abscess, formed either beneath the conjunctival covering of the cornea, or in the very substance of the latter. The mode of formation is exemplified in some cases of violent inflammation of the eye; but, it is observed, that when an ulcer of the cornea arises from purulent ophthalmy, the ulceration generally begins externally, and extends more and more deeply, until it reaches into the anterior chamber. At other times, the ulcer is produced by the irritation of extraneous substances in contact with the eye, such as quick-lime, pieces of glass, &c.

Although abscesses of the cornea are slow in bursting, they should never be punctured; for the matter, which they contain, is so viscid, that not a particle of it ever issues from the wound, which always exasperates the disease. The safest plan is to let the pustule spontaneously burst; promoting this event, by fomentations, and bathing the eye with tepid milk and water.

An ulcer of the cornea is of a pale ash-colour; its edges are high and irregular; its margin is surrounded by a slight halo of lymph, or a nebulous appearance of the cornea; it creates acute pain, discharges a serous matter, and has a great tendency to spread. Sometimes, the pain is less severe, but more constant, than that experienced during the preceding inflammation of the organ; and it is always increased by exposure to light, and motion of the eyelids. To the deposition of lymph, around the sore, a fasciculus of vessels may be observed to proceed from the sclerotic conjunctiva; but they disappear, when the sore has healed.

When ulcers of the cornea spread superficially, the transparency of the membrane becomes destroyed; when they penetrate the anterior chamber, the aqueous humour escapes, and a prolapsus of the iris may take place. If the ulcer is large, even the crystalline lens and vitreous humour may fall out; and in short, a total destruction of the whole organ be the result. The cicatrix of a large ulcer impairs the texture of the cornea in such a degree, that the injury is irremediable.

Although the ulcer is first caused by inflammation, this is afterwards frequently kept up by the ulcer, and not the ulcer by the inflammation.

Just when the ulcer is making its appearance, and the inflammation of the conjunctiva, or sclerotica is severe, antiphlogistic treatment is indicated; but, after this, the principal aim should be to lessen the extreme sensibility and irritability of the ulcer. The ophthalmy then gradually subsides, or, at most, only requires the use of an astringent collyrium.

The best plan is to take a piece of the argentum nitratum, scraped to a point, and to apply it accurately to the ulcerated surface of the cornea, until an eschar is formed. The eye is to be immediately afterwards bathed with warm milk. At the instant, when the caustic is applied, the patient complains of acute pain; but he is amply compensated for this temporary suffering, by the comfort experienced, a few minutes after the operation.

This sudden production of ease is imputed by Scarpa to the destruction of the irritable surface of the ulcer, and to the eschar, which shields the part affected from the contact of neighbouring surfaces; but the relief only lasts until the slough is detached. On the recurrence of burning pain at the ulcerated part, and of restraint in moving the eye and eyelids, the surgeon, without delay, is to renew the application of the argentum nitratum. The same benefit, derived from the previous operation, will be experienced again. In this manner, the caustic is to be used as often as may be necessary. At every separation of the eschar, the diseased sensibility of the eye, and the extent and depth of the ulcer, will be found more and more diminished. The sore also loses its ash-colour, and assumes a pink hue: a certain mark of its disposition to heal. We must now abandon the use of caustic, and employ merely an astringent collyrium. Towards the end of the case, if relaxation of the conjunctiva should continue, the ung. hydrarg. nitrat. may be applied.

It is proper to remark, however, that very good surgeons object to this free use of caustic, and begin with tepid astringents, which, if the sore should not heal with them, are to be followed by a slight application of the caustic, or that of a solution of four or six grains of it in an ounce of distilled water.

Slight excoriations of the cornea do not require caustic; for them the zinc collyrium, with due attention to the removal of their cause, will be quite sufficient. Also to sores produced by mechanical or chemical injuries of the cornea, caustic should not at first be applied, as they would increase the irritation and inflammation of the eye, and do serious mischief. On the contrary, soothing applications, and antiphlogistic remedies are best.

Sometimes an ulcer of the cornea assumes the form of a fungous excrescence, which seems to derive its support from a plexus of blood-vessels in the conjunctiva. The proper treatment of this case consists in cutting away the fungus, and extending the incision far enough on the conjunctiva to remove, with the excrescence, the net-work of vessels, by which it was supplied with blood. The blood is to be allowed to flow freely, and the cure completed by occasionally touching the part with caustic.

When ulcers of the cornea have a sloughing tendency, and the constitution is much debilitated, bark and the mineral acids are indicated.

Staphyloma signifies that disease of the eye in which the cornea loses its natural transparency, rises above its proper level, and even projects between the eyelids, in the form of a whitish, pearl-coloured, or bluish tumour, attended, when the whole cornea is affected, with loss of sight. To this grievance are added, in bad cases, all the evils which necessarily result from the protuberance of the cornea. The inability of closing the eyelids; the exposure of the eyeball to the air, and extraneous matter suspended in it; and the friction of the eyelashes against the tumour; render the eye painful and inflamed; while the constant dribbling of tears is apt to make the cheek and lower eyelid inflame and ulcerate. Even the sound eye itself is sympathetically affected with tenderness, pain, and sometimes actual inflammation.

The opacity being incurable, the only business of the surgeon is to prevent the inconveniences, produced by the projection of the cornea. In recent cases, when these do not prevail, it is best not to interfere with it, as the disease will often remain stationary during life. In inveterate cases, the prominent part of the cornea must be cut off by passing a cataract-knife completely across it. The flap is to be turned up with a pair of forceps, and the incision rendered completely circular with the knife, or scissors. The aqueous humour, crystalline lens, and some of the vitreous humour usually escape, and the eye is so diminished that the eyelids can cover it again. The dressings, and subsequent treatment, are the same as those employed after the extraction of the cataract. In particular, a strictly antiphlogistic plan will at first be necessary.

CHAP. XVI.

PTERYGIUM AND ENCANTHIS.

Pterygium means a preternatural, reddish, ash-coloured, triangular, little membrane, growing from the internal angle of the eye, about the caruncula lachrymalis, and extending towards, or over the cornea to the great impairment of vision. Although it generally proceeds from the inner canthus, it occasionally arises from the outer one, and, in some instances, from the superior and inferior hemisphere of the eye. It is invariably of a triangular shape, with its base towards the white of the eye, and its apex towards the cornea, at a greater, or lesser distance from the axis of sight. In a few uncommon cases, two * or three pterygia, of various sizes, are met with in the same eye; and their points may even coalesce on the centre of the cornea, so as completely to hinder vision.

The common pterygium, is said by Scarpa to consist of a thickening of the layer of the conjunctiva spread over the cornea; yet, be it remembered, that the greater part of the disease is not at all on the cornea, and that some specimens of the *pterygium crassum* have a deeper origin than any part of the conjunctiva.

A peculiar feature of the membranous pterygium is the facility, with which it may be taken hold of with a pair of forceps, and raised in a fold over the cornea, when it extends thus far upon the eye. Sometimes a pterygium assumes a malignant cancerous nature, and then it has a bright red colour, like sealing-wax, easily bleeds when touched, is firmly adherent to the cornea, and occasions lancinating pains, which extend over the whole eye and temple. Scarpa recommends this case to be treated on the palliative plan; but it might be proper to attempt the total excision of the disease; and certainly this measure would be necessary, if it could not be checked by other means.

The ordinary membranous pterygium is not attended with pain, and has no tendency to become malignant. Frequently, it does not increase so as to interrupt vision at all, in which case, its removal is scarcely a matter of necessity.

The cure is performed by lifting up the pterygium with forceps and accurately cutting it away from the surface of the cornea, with a pair of curved scissors. As one part of it is the delicate layer of the conjunctiva, forming the natural covering of the cornea, a cicatrix, and a degree of dimness, necessarily remain after the operation. The opacity, however, is always of much less extent, than the pterygium.

The detachment need only extend as far as the commencement of the sclerotica, and then the separation is to be completed by a semilunar transverse incision †, encroaching not more than one line on the conjunctiva. The subsequent part of the treatment chiefly consists in preventing inflammation.

An incipient *Encanthis*, is a small, soft, red, and sometimes livid excrescence, growing from the caruncula lachrymalis, and neighbouring semilunar fold of the conjunctiva. In the inveterate state, its magnitude is considerable, and its roots extend beyond the caruncula lachrymalis, along the lining of one or both eyelids. The complaint excites chronic ophthalmy, prevents the complete closure of the eye, and by compressing and displacing the puncta lachrymalia, obstructs the free passage of tears into the nose. The surface of the excrescence is at first granulated like a mulberry; but, after the tumour has become large, only a part of its outside has the above appearance, while the rest seems like a smooth, whitish, ash-coloured substance.

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* Plate 4. fig. 2. Two pterygia, of different sizes, on the same eye. A, the larger one, next the nose; B, the smaller one, next the temple. The straight and semicircular lines on the pterygium, A, denote the double direction which ought to be given to the incision, in extirpating the malady.

† See the shape of the incision, Plate 4. fig. 2.

As of pterygium, so there is a malignant species of encanthis, denoted by its dull red colour, bleeding tendency, lancinating pain, excessive hardness, and very fetid discharge. The same practical observations apply to this case, as to the cancerous pterygium.

The cure is accomplished by raising the tumour from its base, and lifting up the elongation, extending along the inside of the eyelids with a pair of forceps, and detaching them with a sharp bistoury.

No more of the caruncula lachrymalis is to be removed, than is absolutely essential to the success of the operation, in order that an irremediable weeping of the eye may be avoided.

CHAP. XVII.

DROPSY OF THE EYE.

When the secerning extremities of the arteries, and the minute mouths of the absorbent vessels of the eye, do not act in their naturally reciprocal manner, the organ may become distended with fluid, attended at first with great weakness, and afterwards with total loss of sight. Authors describe one case, as proceeding from a morbid increase of the aqueous humour, and another as resulting from an augmentation of the vitreous, combined perhaps with a diseased alteration of the alveolary membrane, by which this humour is produced. The eye assumes an oval shape, terminating in a point on the cornea, and, as the organ enlarges in all dimensions, it projects from the orbit, so as to cause great deformity, and prevent the closure of the eyelids.

The disease is sometimes preceded by an obstinate internal ophthalmy. In other instances, it is preceded by no inconveniences, except an uneasy sensation of tumefaction and tension in the orbit, a difficulty of moving the eyeball, and a considerable impairment of sight. When the eye has assumed an oval figure, and the anterior chamber has become preternaturally capacious, the iris is situated more backward than natural, and tremulates on the slightest motion of the eyeball. The pupil remains dilated in every degree of light, and while the crystalline is sometimes discoloured in the earliest stage of the disease, sometimes it does not become opaque, before the disease is far advanced.

In the last stage of it, when the eye projects from the orbit, and does not admit of being covered by the eyelids, the same grievances originate as in bad cases of staphyloma. Violent inflammation, ulceration, and total destruction of the eye may follow, with caries of the orbit, and even a fatal termination. No correct knowledge of the causes of dropsy of the eye has yet been obtained, in addition to the facts, that a slow inflammation of the interior of the eye sometimes precedes it, and that it may be joined with a general dropsical affection of the system. The prognosis is always unfavourable, as far as the restoration of sight is in question. The increase of the disease, however, may possibly be prevented, and, at all events, unless a general varicose state of the organ, and a tendency to carcinoma exist, the several grievances, produced by the magnitude and exposure of the eye, may be obviated. When a dropsical habit attends the complaint, calomel and hemlock, or calomel joined with digitalis, stimulating and mercurial liniments rubbed on the eyebrow, a course of mercury, electricity, and a blister, or issue near the diseased organ may be tried. In other cases, cupping and blistering the temple, or nape of the neck, with various alterative medicines, may be directed. Astringent collyria are generally condemned as hurtful, and tepid emollient applications preferred.

When the large size of the organ brings on the same kind of distressing complaints, as usually attend large protrusions of the front of the eye in staphyloma, the same treatment should be adopted as in the latter case.

A portion of the centre of the cornea, about as broad as a pea, is to be cut off, and as much of the humours then pressed out as will permit the eyelids to be brought over the eye. A pledget and bandage are to be the only applications, until inflammation has taken place, which is usually about the third or fifth day, when antiphlogistic means and emollients may be useful.

When a fungus grows out of the internal part of the eye, after the operation, and its return and increase cannot be prevented by caustic, the preservation of the patient's life will render the extirpation of the whole of the diseased organ absolutely indispensable.

CHAP. XVIII.

CANCER AND EXTIRPATION OF THE EYE.

Cancer of the eye mostly begins in the conjunctiva, and seems analogous to carcinoma of other mucous membranes, being at first like it of a comparatively mild character, though afterwards assuming a malignant and fatal nature. In its commencement it is generally restricted to the conjunctiva, which becomes swelled, thickened, and prominent between the eyelids, so as even to hide the cornea. In a more advanced stage, the eyelids, and the lachrymal gland and caruncle, are frequently involved, and sometimes all the neighbouring part of the cheek. The peculiar character of the ulceration, the fetid quality of the discharge, the acute lancinating pains, and the cartilaginous hardness of the fungus, sufficiently prove the very serious and incurable nature of the disease.

Other forms of disease in the eye have also been classed with cancer, especially a case in which the eyeball becomes irregular and knobby, and swells to the size of an apple; the sight is gradually lost; the blood-vessels in the white of the eye enlarge; and the whole external and internal structure of the organ is so altered, that the part resembles a piece of flesh, and no vestiges of its original organization remain. The fungous growths, which sometimes proceed from the interior of the organ after operations for the relief of staphyloma and dropsy of the eye, have likewise a character so malignant, as to be set down as cancerous.

Until lately, fungus hæmatodes of the eye was always confounded with cancer.

Scarpa is perfectly correct in representing true cancer of the eye as less destructive than fungus hæmatodes; first, because it makes its earliest appearance on the exterior parts of the eye, so that whatever relates to the origin and formation of the disease is open to observation; and, secondly, because the cancerous fungus of the eye is very frequently, not actually malignant at first, but becomes so in process of time, or from improper treatment, in consequence of which it assumes the real character of scirrhus, and, afterwards of phagedenic cancer, during which interval the art of surgery may be resorted to with effect. According to the same writer, we have no pathognomonic symptoms, excepting one, indicative of the exact period when the sarcoma of the eye changes from a benign fungus to carcinoma. The exquisite sensibility, darting pains, rapidity of growth, colour, and ichorous discharge, are by no means a sufficient criterion, and, says Scarpa, the only symptom, if not entirely pathognomonic, at all events less uncertain than any other, is the almost cartilaginous hardness of the malignant ulcerated fungus, which induration is not met with in the benign fungus, and never fails to precede the formation of cancer.*

Under particular circumstances, it becomes indispensably necessary to remove the eyeball; as, for instance, when the organ protrudes from the orbit, cannot be reduced, and the disease creates both great irritation and disfigurement. The operation is also requisite for certain cases of ulcerated staphyloma, and for every form of disease, in which the coats and humours of the eye are so altered, as not to admit of being restored to a natural state, and in which the distemper, if unextirpated, would be likely to end fatally, either by extending its ravages to the orbit and brain, or by keeping up such pain and irritation as must ultimately destroy life.

Cancer and fungus hæmatodes of the eye, however, are the two diseases, for which the operation is most commonly required.

What is usually called a cancer of the eye does not seem to be nearly so malignant as carcinoma of the breast; for, if the distemper be confined to the globe and the eyelids, cellular substance, and bones of the orbit continue unaffected, the operation generally produces a radical cure; a fact, strongly dictating an early recourse to to that effectual means in surgery, the knife.

In the operation there are two important circumstances, to which attention must be paid. The first is to remove every particle of the disease. The second is to avoid piercing or injuring the orbit.

In order to be able to separate the eyelids far enough from each other, for the easy removal of an eye that is much enlarged, it is sometimes recommended, in the first instance, to make an incision through them at their external commissure. The patient should lie down on a table of convenient height, with his face exposed to a good light. The generality of surgical writers advise the operator, before he begins the dissection, to introduce a strong ligature through the anterior portion of the diseased organ, by which means the part may be drawn out, or to either side, as the convenience of the surgeon may dictate, while he is making the necessary incisions. Hooks have also been recommended for the same purpose.

The best instrument for the operation is a common scalpel. When the diseased part is very large, a knife, slightly bent laterally, may be used on the temporal side of the orbit for dividing the parts deeply situated in it. The upper eyelid having been raised by an assistant, and the lower one depressed by the surgeon himself, the conjunctiva, connecting the eye with the two eyelids, is first to be divided.

As when the eyeball is enlarged, it mostly falls towards the cheek, so that an incision between the diseased part and the lower eyelid cannot easily be made, Richter recommends first separating the globe from the upper eyelid, then dividing the superior and lateral attachments of the eye; and, lastly, its connections with the lower eyelid. This mode of operating is said to be the more easy, because the globe of the eye can always be more readily inclined downwards, so as to make room above, than pushed upwards for the purpose of making room below.

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* Scarpa on the Eyes, p. 511—513. Transl. by Briggs, edit. 2.

Scarpa, after dividing the external commissure of the eyelids, if the tumour be very large, perforates the conjunctiva at the external angle, and from thence, keeping the knife close to the upper plane of the orbit, as far as the caruncula lachrymalis inclusively, cuts through the elevator muscle of the upper eyelid, the tendon of the greater oblique muscle, and the superciliary nerve. The diseased eyeball being then raised, and the lower eyelid depressed, the incision is next continued along the inferior segment of the orbit, from the external towards the internal angle; by doing which, the knife will penetrate between the orbit and lesser oblique muscle, and not pass between the eyeball and this muscle, as would happen in cutting in the opposite direction. The eye, freed from these attachments, and from that formed by the nasal branch of the ophthalmic nerve, will fall on the external side of the orbit, and give the surgeon room on the internal side as far as the bottom of that cavity, where he is to divide with one stroke of the scissars the origin of the muscles of the eye and the optic nerve. He is then gently to bring his finger round to the external side of the orbit, and push its contents a little towards himself, while, with a second stroke of the scissars, he divides all the parts which enter the orbit through the sphæno-orbital fissure.

As soon as the eye has been completely detached, all the inside of the orbit should be very carefully examined, and whatever indurated parts are found should now be diligently removed. In particular, the surgeon should introduce his finger along the inner side of the orbit, where he will feel the greater oblique muscle, which he must dissect away by means of a tenaculum and the scissars.

When the eyelids are affected, they should always be removed to prevent a recurrence of the disease.

As the lachrymal gland is now useless, and particularly apt to be the source of inveterate fungous diseases, if left, it is always to be taken away, whether apparently healthy or not.

The bleeding may be repressed by means of a piece of fine sponge, introduced into the orbit, and a light compress laid over the eyelids. Mr. Travers removes the sponge on the day after the operation, and applies a soft poultice included in a muslin bag, instead of the compress. The practice of cramming the orbit with lint he justly reprobates. * Sometimes a compress, wet with cold water, or the lotio plumbi superacetatis, and put over the eyelids, is the only dressing judged necessary.

When the patient suffers violent pain after the operation, an anodyne should be given. The inflammatory symptoms and fever

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* Synopsis, &c., p. 308.

rarely demand any other means, than a low diet, and aperient saline medicines.

Although the operation mostly succeeds when the disease is true cancer, and limited to the eyeball, the same success cannot be expected when the case is fungus hæmatodes.

Sometimes, the granulations formed in the orbit are flabby and indolent, in which circumstance, a mild astringent should be applied; as, for instance, lapis calaminaris, pulvis myrrhæ, alumen ustum, &c. If they acquire a fungous appearance, they should be destroyed with caustic. The records of surgery inform us, that, in some cases, the cure has appeared perfect for half a year, or more, and then a fungous excrescence has arisen and proved fatal. * Sometimes, a few days or weeks after the operation, headaches, vomiting, convulsions, &c. come on, and end fatally. Convulsions, after the operation, were suspected in one case to be owing to the pressure of the lint in the orbit on the optic nerve; and hence, the late Mr. Ware renounced the plan of introducing dressings within the eyelids.†

Cases present themselves, in which fungous diseases are so confined to a particular portion of the front of the eye, that the removal of the whole organ is unnecessary.

CHAP. XIX.

FUNGUS HÆMATODES OF THE EYE.

The best informed surgeons scarcely know what forms of disease should alone be called cancer of the eye. We here meet with no distempers, which exhibit the peculiar scirrhous structure, that is so generally allowed to be characteristic of carcinomatous disease; yet, this organ is frequently attacked with certain diseases, which in point of malignity, and incurability, are not less dreadful than the cancer of other parts of the body, and have usually gone under the same appellation. Fungus hæmatodes of the eye was one of these cases; but, instead of being allied to cancer, it has a very different and peculiar character, corresponding to that of the same disorder in other structures, some of which are never the seat of true carcinoma.

The second and twelfth chapters of Mr. Wardrop's publication ‡ appear to me highly valuable; the one, as containing a clear description of fungus hæmatodes of the eye, a case which previously

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* Mohrenheim, Beobachtungen, band. ii.

† Trans. of Med. Society of London, vol. i. p. 152.

‡ See Obs. on Fungus Hæmatodes, or Soft Cancer, 1809.

had not been distinctly explained; the other, as furnishing us with an excellent comparative view of this disease and cancer.

In fungus hæmatodes of the eye, the pupil is dilated, has a dark amber, or greenish hue, instead of its natural deep black colour, the iris is motionless, and the sight seriously impaired, or even quite lost from the first. One of the earliest symptoms, however, is a white shining substance in the posterior part of the eye, visible through the pupil in some particular positions of the head; but not in all; an appearance, compared to that of burnished iron. As the disease advances, this deviation from the natural appearance of the pupil is discovered to be produced by a solid substance, which is formed at the bottom of the eye, and gradually approaches the cornea. At length, the excrescence occupies the whole interior of the eye behind the iris, and appears through the pupil to be of an amber or brown colour. In this stage of the disease, Mr. Wardrop has known two cases, which were mistaken for cataracts, and, in one of them, an experienced surgeon actually attempted couching. In a case of cataract, however, the opacity lies immediately behind the pupil; in the fungus hæmatodes, it is deeply situated in the posterior part of the eye. In the cataract, also, the pupil generally retains the power of dilating and contracting in different degrees of light; but, in fungus hæmatodes, the pupil never varies its size, and is usually dilated.

When the disease advances still further, the form of the eye-ball begins to alter, acquiring an irregular knobby appearance; and at the same time, the sclerotic coat loses its natural pearl-white colour, and becomes of a dark blue, or livid colour. The tumour, by its continued growth, finally occupies the whole anterior chamber; and, in some cases, a quantity of purulent matter collects between the diseased mass and the cornea.

At last, the cornea ulcerates, and the tumour protrudes, or else it makes its way through the sclerotic coat, so as to be covered by the conjunctiva.

The protruded fungus is generally rapid in its growth, often attains a large size, is of a dark red, or purple colour, has an irregular surface, and is frequently covered with coagulated blood. It bleeds profusely from the slighest causes, and its most prominent parts occasionally slough.

Frequently, the absorbent glands, about the parotid gland, and lower jaw, become affected, sometimes attaining an enormous size.

On dissection, the retina is mostly found annihilated, the diseased mass extending forwards from the entrance of the optic nerve. Sometimes the tumour pushes before it the choroid coat, and ultimately occasions its total absorption; while, in other instances, this membrane remains in its natural situation, having no apparent connection with the disease. The morbid growth itself has a medullary appearance, its consistence and colour, however, being subject to some variety. According to Scarpa, the optic nerve and retina are always the structures first attacked. Sometimes the optic nerve becomes thicker and harder than natural, assumes a brownish ash-colour, and loses its natural tubular appearance. Sometimes, it is converted into a tumour, of the figure and size of an olive, the disorganized substance of which exactly resembles that of the fungus, which fills the orbit, and projects beyond the eyelids. In other instances, the nerve is split into one or more pieces, the morbid growth filling up the intervening spaces, and surrounding the different portions of the nerve. It is noticed by Mr. Wardrop, that when the optic nerve is diseased, the alteration in its structure generally extends to its junction with the opposite nerve, and often further, the thalamus being converted into an irregular, soft pulpy mass, more or less blended with blood. Sometimes, the dura mater and pericranium exhibit dark red-coloured spots; and on other occasions, the tunica arachnoides and pia mater are studded with numerous white spots, which, on being cut into, are found to be small bags, or abscesses containing a white viscid fluid like cream.

Children are more subject than adults to fungus hæmatodes of the eye; for out of twenty-four cases, with which Mr. Wardrop was acquainted, twenty were in children under twelve years of age. On the other hand, true cancer of the eye mostly afflicts persons advanced in years.

Children generally lose the sight of the affected eye, before the disease is at all noticed by the parents. In many cases, however, the appearance of the diseased substance at the bottom of the eye is preceded by a blow and inflammation of the organ. But when no external violence is concerned, the first perceptible symptom is merely a little fulness of the vessels of the white of the eye. Sometimes, the iris is full of vessels, its colour changes, and the pupil is considerably dilated and motionless. The child seldom complains of much pain; but sometimes appears languid and feverish.

In adults, the disease generally begins without any apparent cause; though, sometimes, it is preceded by a blow. As in children, it commences with a slight redness of the conjunctiva, and an impairment of vision. These symptoms increase slowly, and at length are followed by headaches, which often become exceedingly agonizing, especially during the night, and continue with violence, until the eye bursts, and the humours are discharged.

In most cases, only one eye is affected with the disease; but exceptions are recorded.

As surgeons are utterly unacquainted with any internal or external medicines, which have the power of checking or curing fungus hæmatodes of the eye; and as it is the nature of the disease to extend its ravages till the patient is destroyed, the only chance of preservation depends upon the early extirpation of the affected eye, care being also taken to remove every part in the orbit having any appearance of participating in the distemper. Hitherto, however, with few exceptions, the operation has not prevented the return of the disease, and a fatal termination. When the constitutional nature of the complaint, its extension along the optic nerve, and its usual affection of several organs are considered, this result seems almost a necessary consequence, the great chances of which should at all events be contemplated in any prognosis that may be given.

CHAP. XX.

AMAUROSIS,

Or, Gutta Serena, is the name given to a weakness, or total loss of sight, arising from disease, whether affecting the structure, or function of the retina, the organ, usually considered as the medium, by which the impressions, received from the rays of light that enter thus far into the eye, are communicated to the sensorium, so as to constitute vision. One of the best divisions of amaurosis, therefore, is into *organic* and *functional*[*]; and when the class, to which any particular case belongs, can be recognized in practice, the information is highly important, with reference both to the prognosis and treatment; for organic disease of the retina, of the optic nerve and thalamus, or of the parts of the brain immediately connected with them by function, are absolutely incurable; whereas, a possibility of cure attends many examples of functional amaurosis, unaccompanied with organic disease of the parts constituting the immediate seat of vision, and arising from a kind of sympathy between these parts and others, which are the seat of some kind of irritation, or disease. The truth of this proposition is as evident as the fact, that, if the diminution or suspension of vision depend upon the sympathy of the eye with the morbid condition of another organ, and the latter admit of being effectually cured, before any unfavourable change has taken place in the retina and optic nerve, from too long an interruption of their function, the power of vision may generally be restored. This remark proves also the usefulness of other divisions of amaurosis into *recent* and *inveterate*, *incomplete* and *complete*, *&c.* the chances of benefit being much influenced by the differences to which these epithets refer. Unfortunately, a great deal of the ill success in the treatment of amaurosis depends upon the connexion of the disease with more causes than one; for, the case may be both organic and functional at the same time; and, in addition to the existing disease of some part, which perhaps had a principal share in causing, at first, the functional, and afterwards the organic affection of the retina, there may now be a general derangement of the health, that would leave but little, or no hope of recovery, even if the organic nature of the amaurosis did not exist. Such cases might, with much propriety, be named *complicated.*

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[*] See Travers's Synopsis, &c., p. 159.

Amaurosis is mostly attended with dilatation of the pupil; and a motionless state, or diminished activity of the iris, while the natural black colour of the pupil and general transparency of the humours, in cases not resulting from severe ophthalmic inflammation, are but little changed. Sometimes, however, even in the complete and most irremediable forms of the disease, the pupil is of its natural size, and the iris capable of motion. In particular instances, the diameter of the pupil is considerably lessened. Although the transparency of the humours is unaffected, a skilful examiner will generally perceive behind the iris, a change in their appearance, the pupil rarely exhibiting the clear, shining blackness, which is seen in a healthy eye. On the contrary, it has a dull, glassy, or horny look, and sometimes a greenish tinge. Occasionally, indeed, it has a whitish opaque appearance, that may cause the complaint to be mistaken for an incipient cataract. These alterations in the natural colour of the pupil are generally ascribed to a thickened opaque state of the retina, producing a reflection of the rays of light from it, and Scarpa regards this symptom as one of a very unfavourable character. In addition to this dull glassy look of the pupil, the aperture seldom retains its perfectly circular form, the lesser circle of the iris becoming irregular or angular. The pupil is also more or less displaced, being almost always drawn upwards and inwards. Sometimes, in organic amaurosis, a white or greenish-yellow spot may be discerned in the fundus of the eye, a little on one side of the axis of vision; but it is occasionally observed in persons who complain little or not at all of their sight. Mr. Travers suspects that it may depend upon a deficiency in the secretion of the choroid pigment, an adhesion between the choroid and retina, and discolouration of the latter.[*]

With respect to the impairment of vision, it sometimes amounts to absolute and complete blindness; but, in general, the patient can distinguish light from darkness, and even perceive bright colours and large objects. The diminution or loss of sight, when not instantaneously produced, as it sometimes is by lightning, apoplexy, or mechanical injury, is always preceded by a defective state of the eye, before which numerous small substances like insects (muscæ volitantes), pieces of cobweb, &c. seem to fly about in the air, especially when the patient looks at a white surface. This symptom is worthy of recollection, as one of the criteria between incipient amaurosis and the early stage of cataract, which last is attended with a simple dimness or cloudiness of vision. In the beginning of amaurosis, the patient in reading misses whole words or lines, which he cannot make out, unless the position of his eye and head be changed for the purpose. Frequently, all objects appear to be surrounded with a tremulous zone of various colours, or the eye is often disturbed by false luminous appearances, even when it is shut, and in a room perfectly dark. Other not unfrequent symptoms of early and imperfect amaurosis are double vision, from an alteration in the axis of sight; the appearance of objects in a distorted shape, or with a colour that does not really belong to them; an obliquity of sight; a degree of strabismus; and severe pain in the orbit, eyebrow, or other part of the head.

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[*] Synopsis, &c., p. 148.

All cases of amaurosis may be referred to two classes; one, attended with a diminution in the irritability of the whole eye, the patient constantly preferring a strong light; the other, characterized by great tenderness and irritability of the organ, and aversion to a vivid light. The latter state seems to imply the continuance of a degree of inflammation within the eye, to which the first affection of the retina itself may often be imputed.

As Mr. Travers has remarked, the history, and concomitant appearances, or morbid states associated with amaurosis, will commonly indicate whether it be *functional*, or *organic*. Thus, he observes, diseased changes in the situation, or texture of the eyeball, or in the brain, a hemiplegia, or partial paralysis, with other signs of apoplectic, or other pressure on the brain; an acute, deep-seated inflammation of the eye; a fulness of the superficial vessels of the conjunctiva; a bluish grey tint of the sclerotica; a degree of bulging on one or more sides of the eyeball; or a loss of its sphericity, point out the amaurosis as *organic*. On the other hand, he has known *functional* amaurosis produced by a wound of the scalp, caries of the skull, disease of the antrum, and abscesses about the face, the eye being in all these cases sound, and the orbit untouched by the neighbouring disease. Functional amaurosis may also depend upon immoderate exertion of the eye; disorder in the functions of the stomach, liver, and uterus; sudden and alarming depletion; the suppression of habitual secretions; difficult dentition; worms in the bowels; and the deleterious effects of certain substances upon the organ, or the system. Amongst other predisposing causes are also enumerated sedentary occupations, producing a torpid state of the liver and bowels, and combined with much exertion of the eye upon minute, or shining objects, while the head is in a depending position; the use of optical glasses; obstinate amenorrhœa; or constipation of the bowels, with determination of blood to the head in a full habit.*

With regard to the prognosis, when amaurosis is complete, and been of some continuance, no mode of treatment can be expected to restore vision. Complete, inveterate amaurosis, with organic injury of the substance constituting the immediate organ of sight, may, indeed, be set down as a disease absolutely incurable. Amaurosis is generally incurable, when it has existed several years in persons of advanced age, whose sight has been weak from their youth; when it has come on slowly at first, with a morbid increase of sensibility in the immediate organ of sight, then with a gradual diminution of sensation in this organ, to the state of utter blindness; when the pupil is either motionless, and has lost its circular shape, without being much dilated, or when this aperture is dilated in such a degree, that the iris seems as if it were wanting, and its margin is irregular and fringed; when the bottom of the eye, independently of any opacity of the lens, presents an unusual paleness, like that of horn, or else a greenish hue; when the case is attended with universal headache, and a constant sense of tension in the eyeball; when it has been preceded by a violent, protracted excitement of the whole nervous system, followed by general debility and languor; when it is connected with epilepsy; when it is the consequence of severe internal ophthalmy; when, besides being of long standing, it has originated from concussions of the head, blows on the eyeball, or injuries of the supra-orbitary nerve, or from the entrance of foreign bodies into the eyeball; exostoses on the forehead, sides of the nose, or os maxillare; or when it is conjoined with a manifest change in the figure and dimensions of the eyeball. The distorted appearance of objects in an early stage of the disease, was regarded by Beer as an unfavourable omen, because indicating, in his opinion, disease of the brain.

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* See Travers's Synopsis, pp. 142—146.

Incomplete recent amaurosis is mostly curable when not produced by any causes capable of permanently injuring the organic texture of the optic nerve and retina, and when the immediate organ of sight retains some sensibility to light. Recent and sudden cases, in which the pupil is not excessively dilated, and its disk is regular, while the bottom of the eye is of a deep black colour; cases not accompanied by any acute and continual pain in the head and eyebrow, nor by any sense of constriction in the eyeball; cases which originate from violent emotions of the mind; disorder of the stomach; plethora; suppression of habitual evacuations; great loss of blood; nervous debility, of not an inveterate nature in young subjects, are all, generally speaking, curable. Amaurosis is also mostly remediable when it is periodical, or comes on during convulsions, the efforts of difficult parturition, and towards the termination of acute, or intermittent fevers.

When the eye is equally free from marks of organic change, as Mr. Travers has justly observed, the slow and the steadily progressive amaurosis is more difficult of cure, than either the sudden, or the rapidly advancing form of the disease.*

Rules for the treatment of amaurosis cannot be of much value, unless founded on a correct view of the causes of the disease, or drawn from successful experience. A great deal of the common difficulty in the cure, I believe, is owing to our ignorance of the causes, to their frequently being various, complicated, and incapable of removal; or, if removable, their effects on the eye cannot be dispersed with them. From what has been previously stated, it must be clear, that this is most likely to be the case, when the disease has existed a long time, and come on in a slow, and gradual manner.

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* Synopsis, &c., p. 298.

When functional amaurosis depends upon disorder of the primæ viæ, habitual costiveness, and an increased flow of blood to the head and eyes, purgatives are found in this country to answer better, than the free employment of tartarized antimony, in emetic and nauseating doses, so highly praised by Richter and Scarpa. Mr. Travers employs the blue pill, with gentle, saline purgatives, and tonics. In most of these cases, he observes, we should first aim at the regulation of the visceral functions, and then employ tonics. The blue pill with colocynth, rhubarb, or aloes, and the combination of soda with rhubarb and calumba, he recommends for the first purpose; the mineral acids, bark, and steel, for the second.*

When amaurosis is recent and sudden, and signs of an obscure inflammation are present, Mr. Travers has recourse to mercury, introduced into the system gently, and just sufficiently to make the mouth sore. Dr. Frick has seen much advantage from mercury, or calomel, in cases of incipient amaurosis, attended with deep-seated, and especially an intermittent pain in the head, or orbit.†

In cases, accompanied with plethora, great determination of blood to the head and eyes, or chronic, deep-seated, ophthalmic inflammation, venesection, cupping on the temple, and the occasional use of leeches, are necessary. Besides topical bleeding, the only loal remedies, which now possess much confidence in amaurotic diseases, are blisters, issues, and the moxa. Any of them may be applied to the nape of the neck, or the blisters may be put over the eyebrow, or on the temple, and either repeated or kept open.

Many of the varieties of functional amaurosis present clear indications: thus, when the disorder is connected with worms, the suppression of habitual evacuations, or immoderate exertion of the eye on minute or shining objects; the first requisite steps to any melioration of the sight must be the removal of these particular causes. Also, when a general bad state of the health and mental despondency are joined with the impairment of vision, these states must, if possible, be obviated by due means; proper medicines and diet; regular exercise in an open carriage, or on horseback, in a dry salubrious air; change of scene, and the pleasures of society.

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* Synopsis of the Diseases of the Eye, p. 304.

† On Diseases of the Eye, ed. by Welbank, p. 153.

CHAP. XXI.

CATARACT

Is the term applied to every kind of opacity in the eye, situated between the vitreous humour and iris, and causing more or less impediment to vision by hindering the rays of light from duly reaching the retina. The opacity may be in the crystalline lens, or its capsule, or in the posterior chamber between the capsule of the lens and the back surface of the iris, frequently named the uvea. When it affects the lens or its capsule, it is called a *true cataract;* but when it consists of opaque matter, deposited in front of these parts, it receives the name of a *false cataract.* Cataracts are also divided into *idiopathic*, or such as arise from internal, but generally unknown causes, and into *accidental*, which originate from external violence, or active inflammation. The idiopathic generally affects both eyes; the accidental is more frequently confined to the organ that has been injured.*

The idiopathic disease is usually formed with remarkable slowness, and at first may easily be mistaken for amaurosis. In cases of cataract, all objects seem to the patients obscured by a thin mist; and the diminution of vision is exactly in proportion to the opacity manifest behind the pupil. The opacity is first noticed in the centre; seldom, towards the edge of the pupil. Hence, the clear view of such objects as are directly in front of the eye is prevented, while others, laterally situated, may yet be seen with tolerable distinctness. Hence, also, the eye-sight is better in the shade, where the pupil is dilated, than in a strong light, where the iris expands over the transparent circumference of the cataract. As the opacity augments, a black ring is observable round the pupil; and ascribed by Beer to the shadow of the iris upon the lens. To a patient with cataract, the flame of a candle appears surrounded by a whitish circle, which enlarges as he retires from the light; but when the opacity is far advanced, the flame cannot be discerned, and the patient can then merely judge of the distance of its light from the eye. A cataract, in its early stage, does not impair the motions of the iris; and the eye-sight receives assistance from convex glasses.

In amaurosis, the cloudiness in the eye lies far behind the pupil, and has a concave, greenish, or reddish appearance. The diminution of sight is not at all in a ratio to the degree of this deep-seated loss of transparency; the pupil is generally dilated and angular; the activity of the iris lessened, or destroyed; and the brightness of the cornea somewhat changed. The increase and diminution of the eyesight does not depend, as in cataracts, upon the quantity of light, or the consequent greater or less dilatation of the pupil; but, on a variety of circumstances augmenting, or lessening the sensibility of the retina. Thus, agreeable emotions of the mind, a hearty meal, or a glass or two of wine, will cause a temporary improvement of the sight; while long-fasting, mental anxiety, and every debilitating cause, will have the contrary effect. The flame of a candle, and the zone around it, instead of being white, as in cataract, exhibit the various colours of a rainbow. Glasses afford the patient no assistance, and lateral objects are generally as indistinct as those situated directly before the eye. (*Beer.*)

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* Guthrie's Operative Surgery of the Eye, p. 190.

Idiopathic cataracts affect persons of all ages; but most frequently such as are advanced in years, though the number of young subjects with the disease is considerable, and infants are occasionally born with it. Females are sometimes supposed to be more numerously afflicted than males. Cataracts are not found to prevail with increased frequency in any determinate kind of constitution; neither has previous disease any influence on its formation, unless it should have attacked the part, or the eye generally, by particular and direct sympathy. Scrophula and syphilis are never concerned in the production of a cataract, except when they extend their effects from other parts of the eye to the lens or its capsule, in which case, the disease is not properly idiopathic.* Various examples are recorded in proof of the prevalence and frequency of cataracts in particular families, and of an hereditary predisposition to them; but, as facts of this kind are not very common, and the disease is extremely so, we may conclude with Mr. Guthrie, that, at all events, a family tendency to cataracts is far less frequent, than an hereditary predisposition to consumption, gout, or scrophula.

The consistence of cataracts is a matter of some importance, particularly, because a method of operating adapted to a soft, or fluid lens, may not be well calculated for one that is firm and hard. A pearl yellow, or brown colour of the lens, may be considered as indicating a hard cataract; while a white, milky, or striated appearance rather denote a soft cataract. But, as Mr. Guthrie has observed, the milky colour of a cataract is by no means a certain test of its fluidity; many cataracts, perfectly white, and supposed to be soft, having been found after extraction to be hard; and, on the contrary, pearl-coloured ones soft. The size of cataracts is a better criterion of their consistence than their colour is; for the smaller the lens is, and the darker its colour, the more solid its substance generally is; while the larger, and more protuberant it is against the iris, the greater is the probability of its being soft.†

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* See Guthrie's Operative Surgery of the Eye, p. 191.

† Guthrie, op. cit. p. 208.

Writers treat of the *hard; caseous, gelatinous*, or *soft;* the *fluid*, or *milky;* and the *capsular*, or *membranous, cataracts.*

When a cataract is hard, it mostly presents one of the colours above specified; the interspace between it and the pupil is considerable; the patient distinctly perceives the light, and can even plainly discern in the shade, were the pupil not too much contracted, large objects, or bright colours. In the dilated state of the pupil, the black circle around the lens is very manifest; and, as the opaque body does not project against the iris, the motions of the pupil are free and prompt, and the front surface of the cataract is flat, without the least degree of convexity. Cataracts, which occur at an advanced period of life, without previous disease of the eye, are frequently of this description; and it is remarked by Beer, that they may exist many years, without an extension of the opacity to the capsule.

In the *caseous, gelatinous*, or *soft cataract*, the lens is thicker and larger than natural, and hence the motions of the iris are considerably obstructed by it. Vision is nearly, or completely prevented; nor is there any improvement of it when the pupil is dilated in the shade, or by the effect of belladonna. The lens is said to have a spotted or flocculent appearance, and no black circle is perceptible around it.

According to Richter, the *milky* or *fluid* cataract is mostly of a white colour, with irregular spots and streaks upon it, the shape and situation of which are sometimes changed by sudden motions of the eyes, or when the eyelids are rubbed over them. The lower half of the pupil is often more opaque than the upper. The altered lens is large, and the opacity close behind the pupil, which is itself generally dilated. The cataract, by projecting forwards, obstructs the motions of the iris, which are therefore slower and less perfect than they ought to be; while the size and thickness of the cataract render the patient so blind, that he sometimes cannot distinguish the light without difficulty, and his power of vision is not materially improved in the shade, or by the application of belladonna: this is particularly the case when the iris is habitually dilated.

In the *capsular*, or *membranous cataract*, either the anterior, or posterior capsule of the lens may be affected. In the latter case, sight is completely prevented, and but little improved by dilatation of the pupil in the shade, or with belladonna. The opacity seldom begins in the centre of the pupil, but generally at its margin, in the form of small shining spots, or stripes; and it never exists long without the lens becoming affected. If the opacity be restricted to the front capsule, the cataract will have a convex appearance, and seem close to, or even in contact with, the iris, so as to interfere with its movements. When the posterior capsule is opaque, the cataract seems deep in the eye, and its surface concave. As this species of cataract is frequently the result of inflammation, extended to the capsule from neighbouring parts, this membrane is often adherent not only to the lens, but also to the hyaloid membrane.*

A cataract is termed *simple*, when accompanied with no other disease of the eye likely to impair its functions, or with no complaint of the general system: *complicated*, when joined with some other morbid change in the eye, or a constitutional disorder, or particular diathesis, like the disposition to gout, rheumatism, erysipelas, &c.

One not unfrequent complication is an adhesion of the iris to the front capsule of the lens; the effect of previous inflammation, and indicated by an angular deformity of the pupil, the loss of mobility in the attached portion of the iris, and the visible state of the adhesion when the pupil is dilated with belladonna.

Cataracts may be complicated by a diseased state of the vitreous humour, exemplified either in the opaque change of its fluid part, or of the hyaloid membrane, termed *glaucoma*, or else in the total disorganization of it, and the destruction of its cellular texture, called *synchysis*.

A very unfavourable complication of cataract is amaurosis, the existence of which, however, must not be positively inferred from the state of the dilated pupil, and motionless, or sluggishly moving iris, because these effects may be caused altogether by the protrusion of a large lens against the iris, as frequently happens in cases of soft and fluid cataracts. But, if these states of the pupil and iris be joined with the patient's complete inability to discern the light, amaurosis certainly exists. Cases very difficult of discrimination sometimes arise, especially when the affection of the retina has commenced subsequently to the cataract, and is incomplete.

The only other complications, which need here be mentioned, are general impairment of the eye by frequent attacks of previous inflammation; its actual presence; lippitudo; cirsophthalmia, or a general varicose state of the vessels of the eye; hydrophthalmia, or a dropsical enlargement of the organ; opacity of the cornea; staphyloma; and incipient fungus hæmatodes.

A favourable prognosis very much depends upon the cataract being free from every complication, both in the eye itself, and the constitution. The best chance of successful treatment attends cases which, besides being unconnected with any of the circumstances or states above specified, have not been accompanied with repeated attacks of severe and distressing headach, or pains in the eye and eyebrow; nor been preceded, at any period of the patient's life, by epilepsy, or convulsions, the renewal of which may be brought on again by the operation, long after their seemingly permanent cure. In hypochondriacal and hysterical patients, an operation is more apt to fail, than in a healthy individual. The pupil should have its regular circular shape, the iris a power of motion in the varying degrees of light, and the patient be able to discern the light distinctly, and, in shady places, where the pupil expands, even bright colours.

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* See Beer's Lehre, and Frick on Diseases of the Eye, p. 161.

It is still a question in surgery, whether in cases of single cataract, the other eye remaining sound, an operation be advisable. The authorities, and reasoning, which might be adduced in support of the propriety of it, would lead me to recommend at all events a further investigation into the question; that is to say, a fair trial of the operation in a sufficient number of cases to justify a positive conclusion respecting its utility or disadvantages; because a few occasional failures do not settle the point. That the plan has answered in many cases, is fully proved by the records of surgery. At the same time, I am ready to admit, that if confusion of vision were to happen only in a very moderate proportion of examples, for instance, in ten out of every hundred operations upon single cataracts, the rest being successful, the practice would hardly seem warrantable, because, unless the risk were still considerably smaller, the surgeon would not be justified in exposing to any disturbance the useful degree of vision, which the patient enjoys from the possession of one healthy eye. On the other hand, it is to be remembered, that the continuance of a cataract in one eye has been set down by very experienced men, not only as a cause likely to induce a cataract in the other, but an amaurotic state of the retina in the eye already affected, in consequence of the long suspension of its functions. The question, therefore, involves several important considerations, which should be correctly weighed against each other.

When both eyes have cataracts in them, and the case has no unfavourable circumstances in it, it is not unfrequent to operate upon both at the same time; but, as Mr. R. Welbank has observed, the saving of a little confinement, the only reason for this method, does not counterbalance the disadvantages arising from the risk of greater inflammation in the eyes, and the danger of an attack of spasm.*

Various internal medicines, and local applications, have been tried for the purpose of dispersing opacities of the lens, or its capsule; but none of them retain the confidence of experienced men. In a few rare cases, patients have regained their vision, and the pupil has resumed its usual transparency, without any operation; a change, that has sometimes proceeded from the accidental displacement of the lens from the axis of sight, of which Boyer has recorded an instance.† Spurious cataracts, or those formed in front of the lens by deposits of lymph, blood, &c. may be occasionally dispersed; but true cataracts, or those occupying the lens, or its capsule, scarcely ever disappear, without an operation for their removal.

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* Frick on Diseases of the Eye, p. 176, note.

† Traité des Mal. Chir. t. v. p. 509

In former times, a great deal of preparatory treatment for the operation, was generally adopted; but, unless the patient be unhealthy, little more is requisite, than a temperate regimen for a few days, and due regulation of the state of the bowels. Timid patients may take a few drops of laudanum a little before the time fixed for the operation; and if much fulness of habit exist, venesection may be advantageous a day or two previously.

At the present time, three principal methods of operating for the removal of cataracts are practised; namely, *extraction; couching*, or *depression;* and the *breaking of the opaque lens and capsule into fragments, which are afterwards absorbed.* However, the latter method is mostly described under the head of couching, of which it has always been regarded as a modification.

Extraction of the cataract is performed by making an incision through the lower segment of the cornea, dividing the capsule, and gently promoting the escape of the opaque body through the wound. The knife for the incision in the cornea, should gradually increase in thickness from its point to its hilt, so that the aqueous humour may not be discharged before the section is completed, and the iris be exposed to injury by falling forwards under the edge of the instrument. Its shape should be such as will permit the incision in the cornea to be finished by one stroke, or movement, and, consequently, its greatest breadth should be at least equal to half of the diameter of the cornea. The broadest part should not be too far from the point, because the nose would then be pricked before the perfect division of the lower part of the cornea had been effected. One of the best knives is that employed by Beer, and represented in plate 3. fig. 3.

As Mr. Guthrie has observed, the position of the patient must necessarily depend upon the surgeon's capability of using both hands with equal dexterity; for, if he can employ only the right, the common position, and ordinary method, are not at all applicable to cases, in which the right eye is to be operated upon.* If he be an ambidexter, he will operate on the left eye with his right hand and on the right with his left: if not, it will be prudent for him to place himself behind the patient, and divide the upper segment of the cornea in the manner which will presently be noticed. When the surgeon can use both hands with sufficient skill, and even when he cannot, if the left eye be the subject of operation, the patient is to sit on a stool, the height of which is exactly such as puts his head on a level with the operator's breast. Hence, the usefulness of a seat contrived on the principle of a music stool, that admits of being raised, or lowered by simply turning a screw, by which means, the most convenient height for the patient's head can be readily arranged. The light, to which the eye is exposed, should not be too strong, because it would render the pupil too contracted; and, in order to make the eye as steady as possible, the other should always be covered with a small compress, or handkerchief.

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* Operative Surgery of the Eye, p. 294.

An assistant is to keep the upper eyelid raised with his fore and middle fingers, and at the same time support the patient's head upon his breast. The operator should be seated rather higher than the patient, and rest his right foot on a stool, in order that his knee may be high enough to serve as a point of support for his elbow. The knife is to be held like a writing pen, and the little finger of the hand that holds it, is to rest steadily on the outside of the cheek. With his left fore and middle fingers, he depresses the lower eyelid, and at the same time lets them make a gentle projection against the eyeball, so as to prevent its motion inwards, away from the knife.

When the eye is perfectly quiet, and its position such, that the whole of the cornea is distinctly in view, and especially its inner and inferior segments, the operator is to plunge the knife into this tunic, a little above its transverse diameter, and about half or three-fourths of a line from the margin of the sclerotica. In this first proceeding, it is of great importance to direct the point of the knife obliquely towards the cornea, as if to penetrate the iris. Not unfrequently, the knife is directed in a line parallel to the iris, and hence it happens, especially in elderly persons, where the cornea is much thickened, and the anterior chamber considerably lessened, that the blade is carried for some distance between the laminæ of the cornea, and consequently the opening is too small, so that the pressure, and other manœuvres, afterwards necessary to get the lens out of the eye, often do great violence to the iris, occasion profuse loss of the vitreous humour, and become the cause of a subsequent closure of the pupil. The arrival of the point of the knife in the anterior chamber is indicated by its bright appearance, the part of the blade buried in the cornea being always obscured.* The cornea having been completely pierced, the knife is now to be conveyed cautiously and steadily across the anterior chamber in a parallel direction to the iris, until its point has passed out of the cornea at a point as nearly as possible corresponding in height and distance from the sclerotica, to that at which it entered. The surgeon should now stop, until the spasmodic action of the muscles of the eye has ceased, which will be in a few moments, when, all pressure on the organ having been removed, the incision of the cornea is to be finished by pushing the knife steadily in the same direction until its edge descends through the lower portion of that membrane, when the eyelids may be allowed to cover the eye again, until the continuance of the operation is resumed.

In making the incision of the cornea, care must be taken not to let the point of the knife wound the caruncula lachrymalis, and nose, or its edge cut the iris, when this falls forwards. The first parts are avoided by inclining the handle towards the temple;

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* Frick on Diseases of the Eye, pp. 185—186.

and the iris may be made to recede from its dangerous situation by gently rubbing the cornea with the left fore-finger.

One of the most essential things in the operation, is to make the section in the cornea sufficiently large for the ready escape of the lens; for, when this is not the case, the force requisite to bring the cataract through the wound, seriously injures the iris, and is apt to excite violent inflammation of it; too often terminating in a closure of the pupil. Hence, if the wound, made with the knife, should not have due extent, it must be enlarged with Daviel's scissars.

The next business to that of making a fit incision in the cornea, is the division of the front capsule of the lens, which should be accomplished with a small steel couching-needle, and not with gold instruments, the bluntness of which renders them ill calculated for the purpose. Some operators make a crucial division of the capsule; while others endeavour to cut it into very minute portions by repeated strokes of the instrument in various directions. This is done in order that the fragments may escape with the lens, and the risk of a secondary cataract be thereby lessened. In this stage of the operation, a skilful operator always avoids lifting up the flap of the cornea too freely, or displacing the lens, an occurrence that increases the chance of a protrusion of the vitreous humour before the cataract is extracted, the difficulty of doing which is then seriously increased by the sinking of the lens further into the eye-ball.* When the iris contracts so considerably as to prevent the safe division of the capsule, the light must be diminished. After this division has been duly accomplished, the lens in general soon escapes through the pupil by the action of the eye itself. If this should not happen in a very short time, the expulsion of the lens is to be promoted by gentle pressure. When its passage forward is still delayed, it is probably retained by an adhesion to the posterior capsule, which is also adherent to membrana hyaloidea. This occurrence, which is not generally attended with an adhesion of the lens to the anterior capsule, is mostly a consequence of previous inflammation. In this emergency, the surgeon is to press upon the lower part of the eye, until the inferior portion of the lens presents itself, when the curette is to be gently insinuated behind it, and its separation completed. When any fragments of the opaque lens yet continue in the pupil, they are also to be taken away with the curette. Frequently, however, the pupil may be freed from them by gently rubbing the upper eyelid with the fore-finger, after the eye is shut. A fine pair of eye-forceps, constructed with a small hook, is usually employed for the removal of any pieces of opaque capsule.

When extraction is to be performed on the right eye, and the surgeon cannot operate with his left hand, he may follow Mr. Guthrie's plan: the upper eyelid is to be raised by the operator, who is to stand behind the patient, and at the same time keep the head steady, either on a low chair, table, or bed. The knife, with its edge di-

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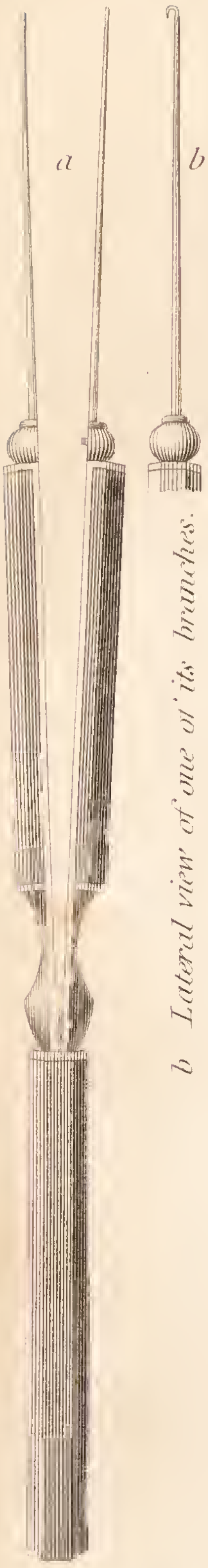
* See Frick on Diseases of the Eye, p. 190. Travers's Synopsis, p. 326.

Fig. 1.

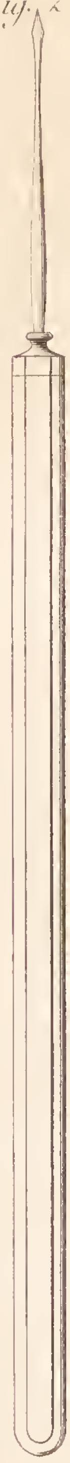


Reisinger's double-hook Forceps. a

b Lateral view of one of its branches.

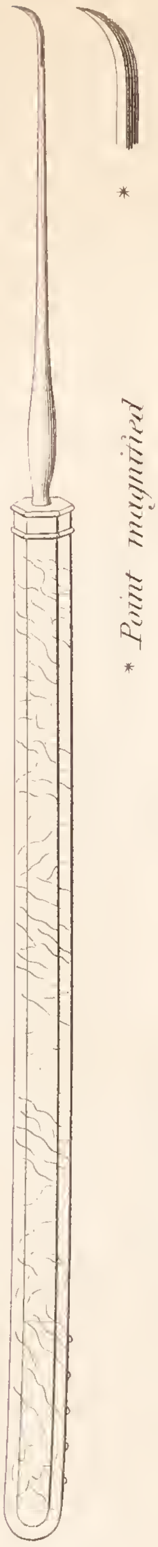
Beer's Needle.

Fig. 2.



Scarpa's.

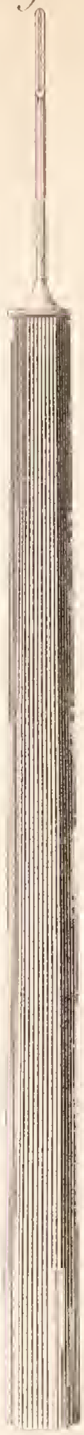
Fig. 3.



* Point magnified

Hey's.

Fig. 4.



Saunders's.

Fig. 5.

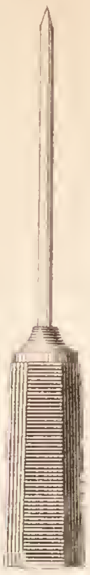


Fig. 6.

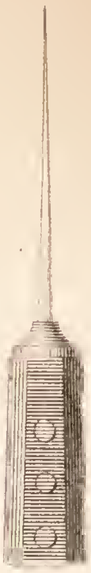


Fig. 8.

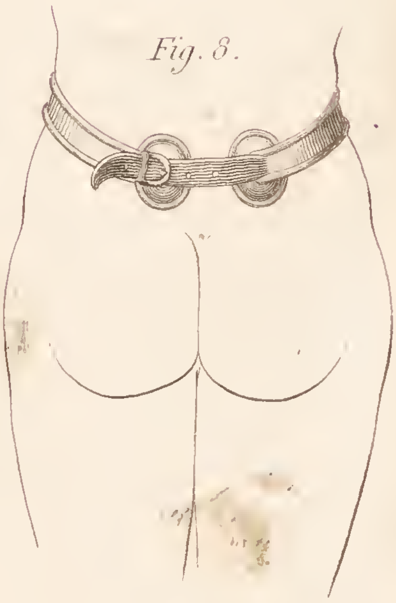
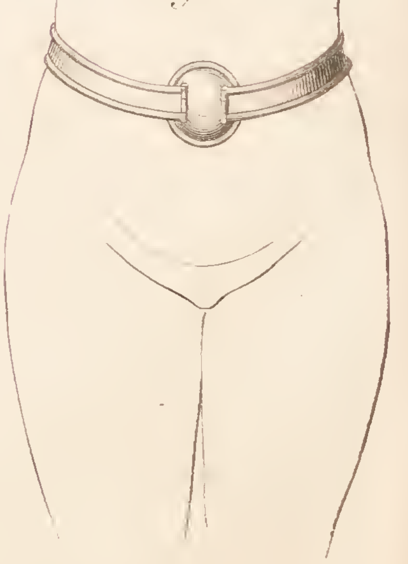
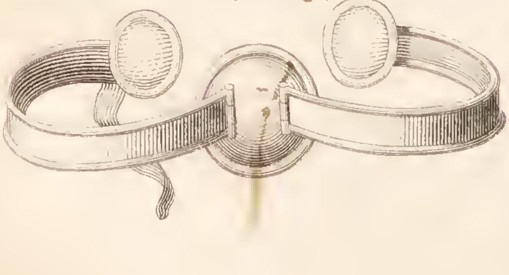


Fig. 9.



Eagland's Truss for Exomphalos.

Fig. 7.



Sidy Hall, Sculpt.

London, Published by Longman & Co. April 6th 1826 rected towards the eyebrow, is to be introduced below the horizontal diameter of the cornea, which is to be divided upwards. Great care must be taken not to wound the upper eyelid, nor let it descend and engage itself behind the flap of the cornea.*

After each method of extracting cataracts, the utmost attention should be paid to placing the flap of the cornea in regular contact with the part with which it was naturally joined, so that its union may follow without any opacity, or uneven cicatrix. Both eyes should then be covered with light compresses, retained by a bandage round the forehead. The patient should be kept in bed, with his head moderately raised; a very low regimen prescribed; and the chamber darkened. If pain arise in the eye soon after the operation, venesection should be practised, or leeches applied to the temple. In general, the wound of the cornea is completely united in two, or three days; but, unless there be reason to suppose that the flap has become displaced, or that the iris has insinuated itself between the edges of the incision, the eye should not be examined before the fifth, or sixth day, when the compresses and bandage may be taken off, and a green eye-shade applied instead of them. Instead of giving purgatives directly after the operation, it is better that the bowels should be opened previously, so that all bodily disturbance may be avoided for at least a day or two.

The best cases for extraction are those in which the cataract is hard, the eye prominent, the anterior chamber large, the pupil not contracted, the fissure between the eyelids ample, the diameter of the cornea not diminutive, the cataract free from adhesion to the iris, and from various other local and constitutional complications already detailed.

Couching is a term that has been applied to various operations, performed for the cure of cataracts with a needle, and has not been restricted to *depression*, properly so named, but extended to the several methods of disturbing, cutting, breaking, and lacerating the cataract, whether it be removed from its natural situation or not. In fact, some kinds of cataracts do not admit of being at once displaced, and pushed out of the axis of vision; but experience proves, that the disturbance, and breaking of them with the needle, frequently lead to their absorption. The surgeon may employ either a slender spear-pointed needle, like that of Beer †, Scarpa's delicate one with a curved extremity, sharp point, and two cutting edges ‡, or Hey's fine, round, couching-needle, terminating in a sharp minute edge of a semi-lunar shape.§ When the aim is merely to disturb and break the opaque lens, or gently lacerate the front capsule, so that the aqueous humour may have access to the cataract, Saunder's very fine needle ‖ will answer the purpose.

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* See Guthrie's Operative Surgery of the Eye, p. 320.

† Plate 5. fig. 2.

‡ Plate 5. fig. 3. The part between the handle and the dotted line may be advantageously deducted from its length.

§ Plate 5. fig. 4.

‖ Plate 5. fig. 5 and 6.

The pupil having been dilated with belladonna, the patient and surgeon are to be seated in the same manner as in the operation of extraction. An assistant is to support the head on his breast, and keep up the upper eyelid with the fore and middle fingers of his right hand; while the surgeon depresses the lower eyelid with those of his left hand. If the curved needle be preferred, it is to be held with its convexity forward, its point backward, and its handle parallel to the temple. The patient having turned his eye towards his nose, the opportunity is to be taken of introducing the needle boldly through the conjunctiva and proper coats of the eye into the vitreous humour, about a line and a half from the margin of the cornea, and a little below its transverse diameter. This place is selected in order that the ciliary processes and long ciliary artery and nerves may not be injured. The first direction of the needle should be towards the centre of the vitreous humour; but, directly after its point has passed through the coats of the eye, the needle may be guided to the upper part of the lens, which, in the first instance, is to be depressed a little downward with the flat convex surface of the instrument. Thus a space is made between the cataract and ciliary processes, for the safe conveyance of the needle into the posterior chamber, in front of the lens and its capsule. In this step of the operation, care must always be taken to keep the marked side of the handle forwards, so that the point may be turned away from the iris. The needle will now be visible in the pupil, and its point is to be pushed transversely as far as the inner edge of the lens. The handle is now to be inclined forwards, by which means the point will be directed through the capsule into the substance of the lens, and, on moving the needle downward and backward, the former will be lacerated, and carried with the latter deeply into the vitreous humour.

The laceration of the anterior capsule is deemed of considerable importance, because the absorption of the opaque lens is thereby promoted, and a secondary membranous cataract frequently prevented.

When the cataract is *fluid*, its contents flow out as soon as the capsule is pierced, often rendering the whole of the aqueous humour so turbid, that the iris and needle are completely hidden. The surgeon should not be disconcerted by this event, but endeavour, as far as he safely can, to lacerate the capsule, and leave the opaque matter in the chambers of the eye to be absorbed, which will often be the case in a few days.

When the cataract is *soft*, and will not admit of depression, the surgeon should freely break and cut it into fragments, taking care not to spare the capsule, and pushing as much of the opaque matter as he conveniently can, forward into the anterior chamber, where absorption is carried on more vigorously than behind the pupil.

When the case is a *secondary membranous* cataract, the surgeon is to turn the point of the needle cautiously towards the pupil, and pierce the opaque capsule, which is to be broken, as far as it is practicable, at every point of its circumference, and the fragments either left in their situation, or pushed through the pupil into the anterior chamber.

When the capsule is adherent to the iris, the attachment may often be broken by skilful and delicate movements of the needle, the cutting edges of which may here be found useful. If the operator prefer a straight needle, he may also imitate Scarpa, and depress the cataract a little in the first instance, so as to make room between the lens and the ciliary processes for the passage of the needle in front of the opaque body. The generality of surgeons carry the needle directly across the posterior chamber, between the iris and the cataract, until its point is beyond the nasal edge of the pupil, with one flat surface towards the lens, the other towards the iris. They then place one of its flat surfaces on the upper part of the lens, which is depressed more or less deeply backward and outward. That it should not be forcibly propelled too far backward, so as to injure and press upon a part of the retina essential to vision, I think must be as manifest as the contrary fault of not carrying the depression far enough, which must leave a risk of the return of the lens to its former situation, or of a dangerous degree of iritis from its lodgment against the uvea.

Reclination, a term, of which so much is now heard in surgery, consists in turning the opaque lens, so that its anterior surface may be upwards, and its posterior surface downwards, in which position its depression is effected. The dilatation of the pupil, by means of belladonna, is a very useful preparatory step in this operation. The needle may be introduced, either at the place usually preferred in the ordinary mode of depression, or through the cornea and pupil, a method distinguished by the name of *keratonyxis*, which is of two kinds. The first is that of Conradi, Beer, and Saunders, for destroying a central portion of the capsule, equal to the size of the pupil, with or without a very gentle opening of the texture of the lens. The second is that of Buchhorn, Langenbeck, Walther, and Reisinger, in which the whole of the lens is broken, the capsule destroyed, and the pieces brought into the anterior chamber. For details of the plans of performing these operations, I must refer to Mr. Guthrie's Work. * After their completion, the eye must be covered as after extraction, means taken to prevent inflammation, and the pupil kept dilated with belladonna, until all risk of the iris contracting adhesions is past.

With respect to the choice of a method of operating, I have already specified the circumstances favourable for extraction. When there is reason to believe the cataract hard, but the case is attended with some condition prohibiting extraction, depression should be preferred.

Soft cataracts are most calculated for plans, in which the main object is to divide and break them into fragments, which, when conveniently practicable, are to be pushed forwards into the anterior chamber, where they are more quickly absorbed, than behind the iris. Membranous, or capsular cataracts, are manifestly not adapted for depression; neither are they well suited for extraction, except where the capsule presents itself in an opaque state directly after the lens has been extracted, in which case, it should be taken out with a pair of eye forceps. In all other circumstances, membranous opacities are most advantageously removed by means of the needle, with which they are to be lacerated, broken, and displaced from the axis of vision.

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* Operative Surgery of the Eye, p. 333.

Congenital cataracts are mostly capsular, and attended with a complete, or partial absorption of the lens. Hence, and also on account of the unsteadiness of children, the proper operation is that of dividing and breaking them with a sharp-edged needle. The late Mr. Saunders was accustomed to operate at any time between the ages of eighteen months and four years; but Dr. Farre considers that of two years the best period. The upper eyelid was kept up with Pellier's elevator; and the child laid on a table, parallel to a window, from which the eye, about to be operated upon, was farthest. Four assistants, and when the child was stout, five were required to confine it. The pupil was dilated with belladonna, previously to the operation, and kept so afterwards, until all danger of the iris becoming adherent to any portion of the capsule, was past. Mr. Saunders had two modes of operating; one corresponding to what is now called *keratonyxis*, that is, the needle was introduced through the cornea and pupil. The other method consisted of the division and laceration of the opaque membrane with the needle, introduced in the manner usually followed in couching, namely behind the iris. The anterior operation was ultimately preferred, because it inflicted slighter injury on the eye, did not disturb the ciliary processes and vitreous humour, and produced less inflammation, than the other method. One peculiarity in most of Mr. Saunders's operations, was that of opening and destroying chiefly the central portion of the capsule, and, if the lens was present, gently opening its texture, without displacing it. This plan mostly requires several repetitions of the operation, which are the strongest objections to it. Modern operators, I believe, find a freer disturbance of the cataract and the displacement of the fragments from the pupil, on the whole, better practice. However, one fact in favour of Mr. Saunders's method, is very strong, namely, out of sixty cases operated upon by him, fifty-two were successful.

Among the arguments, mentioned in favour of operating early, two in particular merit attention. First, when the patient has no perception of external objects, the muscles acquire so inveterate a habit of rolling the eye, that, for a very long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion, nor direct the eye to objects, with sufficient precision for the purpose of distinct and useful vision. Secondly, the retina, when not exercised for a long while, is apt to lose a degree of its sensibility.*

CHAP. XXII.

DISEASES OF THE TONGUE, AND SALIVARY DUCTS UNDER IT.

RANULA

Is a tumour, arising from a distention of one of the salivary ducts under the tongue, in consequence of the existence of some obstruction to the ready escape of the saliva from its orifice.

The swelling is usually situated on one side of the frænum, and, when large, sometimes extends under the apex of the tongue. It consists of a sac, composed of the dilated duct, and filled with clear fluid, purulent matter, or an earthy substance. Unless it be of long standing, its contents resemble the white-of-egg; but, in cases which have existed some time, they are of a thicker quality, and may even acquire a calcareous hardness. The size of a ranula varies considerably in different cases, from that of a pea to that of a hen's egg. In some instances, it becomes exceedingly large, pushing the tongue upward in such a degree, that deglutition and respiration are obstructed, while its lateral pressure thrusts out the teeth, and renders the lower jaw-bone carious. Some swellings of this kind have been known to contain a pint of matter.

The shape of ranulæ is subject to variety: some are round; others oblong †; and elongations of the sac occasionally reach a considerable way backward under the tongue.

Ranulæ are frequently quite free from pain; but, in some instances, they are very painful, especially when the tongue is moved, or when they are complicated with inflammation.

Encysted tumours under the tongue, are sometimes mistaken for ranulæ. In many cases, where ranulæ are reported to have contained a caseous, fatty, or pultaceous substance, the diseases were probably encysted swellings. ‡

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* See a Treatise on some Practical Points relating to the Diseases of the Eye, by the late J. C. Saunders; to which is added, His Method of Curing the Congenital Cataract, by J. R. Farre, M.D. 1811. Of this work, there have now been several editions.

† "On reconnoit, deux especes de grenoüillettes; les unes rondes, placées sous la langue, semblent n' être produites que par la dilatation du canal excrétoire de la glande sublinguale; les autres sont plus longues que rondes, placées à la partie latérale de la langue, et formées par la dilatation du canal excrétoire de la glande maxillaire inférieure." See M. de la Faye's Notes on Dionis.

‡ Richter's Anfansgr. band. iv. p. 4. edit. 2.

When ranulæ attain the size of a walnut, they sometimes burst, and a cure may be the consequence; but, in general, the opening is not large enough; or the lodgment of calcareous matter in the sac, prevents the complete removal of the disease.

Some years ago, the plan of attempting to restore the perviousness of the obstructed duct, by the introduction of a small probe, was suggested by Desault; but the passage of the instrument is mostly difficult, and rarely answers, except in very recent cases.

The common practice is to open the tumour freely; press out its contents; and remove every particle of calcareous matter, that can be felt. With these proceedings, are sometimes joined the plan of cutting away the whole anterior portion of the sac with scissars, and even the attempt to destroy the rest of it with caustic.

Perhaps the excision of a portion of the sac is the surest mode of cure; for when the incision is too small, or closes prematurely, the disease generally recurs. It was in this manner, that my friend Mr. Lawrence treated, with perfect success, an enormous ranula, that formed a large prominent swelling, extending from the symphysis to the angle of the jaw.

When the substance of a tumour beneath the tongue is fat, the best plan is to take hold of the swelling with a hook, draw it forward, and carefully take it out, by detaching it from its lateral connexions with a bistoury; and breaking those on the side towards the raninal artery, with the fingers. If much bleeding occur, a dossil of lint should be pressed into the wound; but the use of a spirituous gargle will generally suffice.

Sometimes, when no swelling is evident, calcareous concretions form in the salivary ducts, and excite pain and uneasiness. In some instances, the calculus projects from the orifice of one of the ducts into the mouth, and admits of being drawn out with a pair of forceps. In others, it is necessary to make an incision, for its extraction.

DIVISION OF THE FRÆNUM OF THE TONGUE.

A preternatural confinement of the apex of the tongue may arise from two causes; viz. the frænum may extend too far forward, or it may not be of sufficient length. The first malformation is the most common; both kinds impede the motion of the tongue, prevent children from sucking, and cause an impediment to speech. Hence, in persons born dumb, the state of the frænum should always be examined. As tongue-tied children are supposed by ignorant nurses to be frequently met with, and the operation for their relief is not exempt from danger, every surgeon should know, that, in infants, an incapacity to suck, in consequence of the evidently immoveable state of the tongue, caused by the above defects, forms the only just ground for dividing the frænum.

Hence, before performing an operation, the surgeon should not be satisfied with merely hearing that a child cannot suck; as this incapacity may be owing to other causes, particularly the large size of the nurse's nipple, adhesions of the sides of the tongue to the inside of the mouth, &c. A nurse brought a child to me a few weeks ago, and told me it was tongue-tied and unable to suck. This I knew must be a mistake, as the infant was a fortnight old, and had at first sucked very well. On examination, the cause of the difficulty of sucking was found to depend upon an excoriated state of the lips. The practitioner ought to examine with his eyes, whether the frænum extends too far forwards; a thing most easily ascertained, as in the natural state, about a quarter of an inch of the under surface of the tongue, from the apex backward, remains quite unconnected with the frænum. When this part ties the tongue too closely to the bottom of the mouth, by reason of its shortness, the surgeon cannot raise the tongue towards the palate with his fingers.

The operation consists in dividing the frænum, as far as seems necessary; and it is so simple, as to require no particular explanation. The best instrument for performing it is a pair of sharp scissars with blunt points. No more of the frænum ought to be divided than is essential to the object in view; and pointed instruments should never be employed. The situation of the raninal arteries renders this caution of the highest importance; for many children have lost their lives from these vessels having been unskilfully wounded by careless or ignorant operators.

The frænum serves to confine the tongue, and keep it from being thrown too far backward in deglutition. If an unnecessary incision, or one that is too extensive, be made, the tongue may be carried beyond the narrow part of the throat, and so engaged in the opening of the pharynx, as not to admit of being brought back again into its natural situation. The first opportunity, which Petit had of observing this event, was in a child, that died about five hours after its frænum linguæ had been divided. Upon passing a finger into the child's mouth, he was surprised at not being able to feel the tongue, and at perceiving, that the posterior opening of the mouth was completely stopped up by a fleshy substance, which, upon an incision being made through the cheek, was found to be the tongue itself.

When Petit was sent for to another infant, which had fallen into a state approaching to suffocation, about two hours after its frænum linguæ had been cut, he immediately tried to ascertain the cause of the occurrence. When he introduced his finger into the child's mouth, he found that the tongue was half displaced backward. There was no difficulty in reducing it; but the accident recurred several times in the course of the day. Mechanical means were now deemed necessary to prevent the displacement. A thick compress was placed on the tongue, and retained with tape applied round the lower jaw. Whenever the infant had occasion to suck, the apparatus was taken off for a short time. The little patient was sent into the country, however, where the plan was neglected, and death from suffocation soon followed.

Petit met with other examples, in which children, in similar danger, were saved by perseverance in the method that he proposed.

The second dangerous consequence, occasionally resulting from the operation of dividing the frænum linguæ, is hemorrhage from one of the raninal arteries or veins. All writers on this operation have noticed the accident. Petit saw it take place, when the large vessels of the tongue were uninjured, and of course the bleeding proceeded entirely from the small vessels distributed to the membrane of the frænum itself. The blood which escapes from them, and collects in the mouth, leads the infant to make continual endeavours to suck, by which means the bleeding is kept up, until extreme or even fatal weakness is induced. As the child continues to swallow the blood, as fast as it oozes into the mouth, the bleeding may never be suspected, until all hopes of recovery are past. Dionis mentions a case, in which the stomach of an infant, which died a few hours after the operation, was found quite distended with blood. With regard to hemorrhage from the small vessels of the frænum, Petit met with several examples of it, where unavailing attempts were made to stop the bleeding with astringent applications, and badly contrived compresses. Hence, he was led to invent, for the stoppage of the hemorrhage, an apparatus, that is at once simple, ingenious, and effectual. The surgeon is to get a piece of birch, and cut it through below the place where two branches of equal size unite. It is to be made to resemble a sort of fork, the prongs of which are to be about eight lines long, and the handle four. It is then to be covered all over with linen, and put under the tongue, in such a way, that the end of the handle is to rest against the middle of the concavity of the arch of the jaw, while the prongs embrace the frænum, and compress the bleeding vessels. The middle of a roller is next to be applied to the dorsum of the tongue, as far back as possible, and the ends, after crossing each other under the chin, are to be pinned to the child's nightcap. In this manner, the vessels are compressed, from below upward by the prongs of the wooden fork, while the bandage makes pressure from above downward. Thus the tongue is fixed, and the bleeding is effectually stopped. But, if the plan should not answer, the actual cautery ought to be applied without delay; and, in the event of its failure, the lingual artery, or carotid should be tied. Hemorrhage from the raninal veins may arise from their varicose state, quite independently of a wound, and prove so obstinate as to require the cautery. Considerable bleeding, from the raninal vessels, have sometimes been suppressed by putting a piece of ice under the tongue.

WOUNDS OF THE TONGUE.

The most frequent wounds of the tongue are transverse. They are hardly ever produced by outward means; but usually by the teeth, when the lower jaw is forcibly and spasmodically brought against the upper one, while the tongue is out of the mouth, as sometimes happens in epilepsy, and falls upon the chin. In this way, deep transverse wounds may be produced, almost separating the apex from the body of the tongue. In such cases, the injury may easily be converted into a sort of cleft, which may remain for ever afterwards, and more or less impede the functions of the organ.

Hence, some writers on surgery have recommended all deep wounds of the tongue to be immediately closed with a suture.

The application of a suture to the tongue being attended with some difficulty, Pibrac invented a very simple bandage for uniting transverse wounds of this organ.* The main portion of it is a little sort of bag, in which the fore-part of the tongue is confined. Thus all motions of this organ forwards, or laterally, may be effectually prevented, but the patient is not deprived of the power of drawing it backward, that very action, which has a direct tendency to make the sides of a transverse wound separate from each other.

Richter objects to Pibrac's bandage, that it is irksome to children, and decidedly unnecessary in all cases, because the motions of the tongue which it directly restrains, namely, those forwards, or to either side, may be hindered by applying a bandage to the jaw, and making the patient refrain from talking and mastication. The same author affirms, that such treatment has answered as well as could be desired, in numerous cases, some of which were large transverse wounds, in restless and unmanageable children. During the treatment, the patient should be allowed only liquid nourishment, which ought to be imbibed through a tube.

If the wound should be so deep as almost to separate the anterior part of the tongue from the rest of this organ, the remaining connection is not to be divided, but an endeavour made to bring about an union with the aid of a suture.

DANGEROUS ENLARGEMENT OF THE TONGUE.

Sometimes, when this organ is inflamed, it swells so prodigiously, that it protrudes between the teeth, entirely fills up the cavity of the mouth, and obstructs speech, deglutition, and even respiration. Here, common antiphlogistic measures will not afford relief with sufficient quickness. The most effectual plan is to make two longitudinal cuts near the edges of the dorsum of the tongue, from one to two inches in length. The copious bleeding, which follows, soon brings about a diminution of the swelling, and the incisions readily heal.

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* Mém. de l'Acad. de Chirurg. tom. ix. p. 22. pl. 9. — Le Blanc, Precis d'Operations.

Jourdain, by taking blood from one of the raninal veins, afforded his patient immediate relief.*

In one example, the disease resisted every means, until a blister was applied to the throat. †

Some inflammations of the tongue have originated from the lodgment of foreign bodies in it, as a fish-bone, or a needle. Other cases have arisen from the injudicious employment of mercury, and the excitement of a sudden and immoderate salivation. Many examples are connected with violent inflammation of the parts about the throat.

Inflammation may induce mortification, and the loss of the greater part of the tongue. Here the treatment must conform to the general rules, delivered in the chapter on mortification.

When, in consequence of any enlargement of this organ, or other disease in the mouth, the necessary food and medicines are for a considerable time prevented from being taken, they may be injected into the stomach through an elastic catheter, which is to be passed through one of the nostrils down the œsophagus.

ULCERS, INDURATIONS, AND TUMOURS.

Ulcers on the tongue of a painful, obstinate, and irritable nature, are sometimes produced by the sharp, or rough edge of a tooth. If the tooth be sound, the projection or roughness must be filed off; if it be carious, the best plan is to extract it. When these objects are accomplished, the sore usually heals without further trouble.

Some very obstinate ulcers of the tongue, connected with disorder of the digestive organs, may be cured by giving small doses of the blue pill every night, with occasional purgatives, and the compound decoction of sarsaparilla.

Ulcers, deserving the epithets *malignant* and *cancerous*, not unfrequently form on the tongue. Sometimes the disease in its incipient state appears as a sore. Sometimes a circumscribed, moveable, or immoveable, scirrhous swelling is first observable, which gradually becomes painful, and ulcerates. In other instances, there is in the beginning only an induration in the substance of the tongue, without the smallest appearance of swelling. The ulcers under consideration are always surrounded by hardness. They may make their first appearance either at the edges, or at the apex, of the tongue. In certain cases, the whole, or a large portion of this organ, is covered with numerous small scirrhous tubercles, which gradually fall into a state of ulceration. I have seen them greatly diminished by a gentle course of mercury. All the medicines, tried in other cases of cancer, especially arsenic, conium, belladonna, hyosciamus, stramonium, &c. may here be exhibited, but, on the whole, the timely employment of the knife merits most confidence.

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* Traité des Maladies de la Bouche, &c.

† Richter's Anfansgr. der Wundarzn. band. iv. p. 29.

Some malignant sores on the tongue, have been cured by repeatedly applying leeches to its under surface.*

It would be inexcusable to pass over in silence such ill-conditioned ulcers of the tongue, as originate during violent salivations. Sometimes similar sores, produced by the same cause, take place at the same time on the tonsils, and, in this circumstance, inexperienced surgeons, or mistaken practitioners, are apt to suppose the ulcers to be of a venereal character. This error leads to the free use of mercury; the sores frequently slough, and the patient's health becoming greatly deranged, he is thrown into a state of imminent peril. Here, it is hardly necessary to observe, that the use of mercury must be immediately omitted, and the mouth frequently washed with a solution of alum.

For the removal of a cancerous portion of the tongue, a bistoury is the best instrument; and the patient's mouth should be kept open during the operation, by something interposed between the teeth. The hemorrhage is the circumstance most apprehended; but we have instances related of large portions, and even the anterior half of the tongue being amputated, and of the bleeding being easily suppressed, either by the actual cautery, or some of the above named means for the suppression of hemorrhage.† I think a tolerably dexterous man might tie the mouth of an artery in this situation, with the assistance of two pair of forceps to draw the ends of the ligature, when the noose had been put over the tenaculum, round the bleeding point. Certainly, cancerous diseases of the tongue may have advanced so far, that an operation cannot be prudently undertaken. The bleeding would be a serious objection; the whole distemper might not be removable; and the contaminated state of the glands, below the jaw, usually existing in this advanced stage, might render a perfect cure quite impracticable.

When the disease is not in the vicinity of the apex of the tongue, the operator may find it difficult to draw the part sufficiently forwards. In this circumstance, surgical authors recommend the employment of a pair of forceps for the purpose, the blades of which are to be covered with linen. Should this instrument be found ineffectual, they advise the surgeon to use a pair of forceps, the blades of which terminate in two short double hooks.

Here, as in all other cancerous cases, it is the duty of the surgeon to take care, that no part, suspected of participating in the disease, be left behind.

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* Medical Communications, vol. ii.

† See Mém. Physiologique et Pathologique sur la Langue, par M. Louis, in Mém. de l'Acad. de Chirurgie, tom. xiv. edit. 12mo.; also Ruysch's Observ. Anat. Chir. obs. 76.

Abroad, surgeons have sometimes effected a cure by applying the cautery, notwithstanding the wound, after the operation, had put on an unhealthy and fungous appearance.* In this country, practitioners might hope for similar success from the cautious employment of caustic; for the revival of the cautery, under any circumstances, is an idea now almost intolerable to every British practitioner.

After the excision of a diseased portion of the tongue, local applications cannot be very well used, nor are they in general necessary, when the patient moves the part as little as possible, and avoids stimulating food.

Cancerous portions of the tongue may also be extirpated, by passing a double ligature through this organ, and firmly tying one part of the ligature over each side of it.

This plan must be infinitely more painful, than the removal of the diseased part with a knife. To the latter method, the hemorrhage is the only objection; and, notwithstanding all that has been said, I think no surgeon ought to venture to cut away a diseased tongue, without having first made up his mind, respecting what method should be adopted for stopping the bleeding.

When much of the tongue has been lost, its functions may be rendered very imperfect. However, numerous cases are recorded, in which the greater part of this organ was lost, and yet the patients retained the faculties of tasting, masticating, swallowing, and articulating words, with considerable perfection.†

The removal of scirrhous and sarcomatous tumours of the tongue may be most conveniently accomplished with a scalpel and a tenaculum. Encysted swellings of this organ are generally of the meliceris kind, and ought, if possible, to be dissected out, without opening the cyst at all.‡

Authors relate examples, in which the tongue was of extraordinary magnitude, either in consequence of original malformation, or disease. Excepting the deformity, some of the patients experienced no particular inconvenience, as they could speak, masticate, and swallow tolerably well.§ Under these circumstances, the removal of the redundant portion would not be advisable; but, if the disfigurement were combined with much inconvenience, the operation ought to be performed.

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* Journ. de Médécine, tom. xviii.

† See Mém Physiologique, &c. sur la Langue par M. Louis, in Mém de l'Acad. de Chirurgie, tom. xiv. edit. 12mo.

‡ Schmucker describes the extirpation of a large encysted tumour of the tongue, the appearance of which had excited suspicions of the patient having two tongues. See Vermischte Chir. Schriften, band. iii. p. 522.

§ Sandifort's Obs.

CHAP. XXIII.

DISEASES OF THE TONSILS AND UVULA.

When the tonsils are inflamed, the swelling sometimes obstructs deglutition and respiration in so dangerous a degree, that prompt succour is urgently required. The most expeditious plan of relief is to scarify the tonsils freely, and promote the bleeding with warm gargles.

Venesection, leeches, calomel, saline purgatives, antimonials, and gargles, may also be of service.

Abscesses of the tonsils should be opened early, so as to prevent the grievances, which would result from the continuance and increase of the swelling. Some neglected cases, in unhealthy scrophulous individuals, have been known to spread to a considerable extent, and not to burst in the mouth, as is usual, but in the Eustachian tube, or even in the meatus auditorius externus, attended with caries of the mastoid process, deafness, and fistulæ.

The tonsils are subject to an indolent enlargement, improperly termed *scirrhus;* as a portion of them in this state may be cut off without the least danger of the rest assuming a malignant nature. When the swelling is considerable, it may seriously obstruct speech, deglutition, and respiration.

In general, astringent gargles prove ineffectual. The tumour, however, admits of being removed, but only so much of it should be taken away as the patient's relief makes necessary. The remaining portion then heals without the least difficulty; a clear proof that the disease is not of a cancerous nature. *

Many good surgeons prefer tying diseased tonsils to cutting them away. The operation may sometimes be accomplished with a common eye-probe bent, and furnished with a ligature, which may be a piece of silver wire or catgut. Another plan is to introduce a double ligature through the nostril, until the noose appears in the throat. With a pair of forceps, the noose is now placed round the tumour. The ends of the ligature, having been brought through a double cannula, which is to be passed as far as the tonsil, are to be fastened to rings at the outer end of the instrument, which is next to be twisted, till the due constriction is produced.

Desault employed a *serre-nœud*, for putting the noose over the diseased tonsil, and producing the necessary constriction. It was nothing more than a little ring, mounted on a longitudinal narrow piece of steel, about five inches long, the other end of which was grooved, or rather forked. The diseased tonsil was first taken hold of with a double hook. With the ring, the noose was conducted along the hook, and put over the tonsil, the ligature was then drawn out, while the ring pressed the noose downward and backward. The requisite constriction was maintained by twisting the ends of the ligature round the forked extremity of the instrument, on the outside of the mouth.*

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* Richter's Anfansgr. de Wundarzn. band. iv. p. 46.

When the disease had a broad base, Cheselden recommended the use of an instrument like a crooked needle, set in a handle, with an eye near the point, threaded with a ligature, which was introduced through the bottom of the gland, and laid hold of with a hook. The needle was then withdrawn; the double ligature brought forwards; and one part tied above, the other below, the tumour, the ends being cut off near the knots. Although the treatment by ligature generally answers very well, cases sometimes occur, in which it is followed by such swelling of the tonsil and adjacent parts of the throat, that the patient is threatened with suffocation, and necessity obliges the surgeon to cut the ligature, and remove it.

The removal of the whole of an enlarged tonsil is unnecessary, and therefore injudicious; because a *portion* of the tumour may always be cut away without any risk of dangerous bleeding. Bertrandi, and other eminent surgeons, have cut away many enlarged tonsils, without ever meeting with an instance of danger from the bleeding.

For the excision of diseased tonsils, Desault sometimes employed a flat sheath, made of silver, and having a notch in it for the reception of the base of the tonsil. The latter part being thus taken hold of, a spring was touched, when a concealed blade immediately moved across the notch, and made the requisite division, without any risk of injuring other parts. However, the operation may be easily done with a pair of scissars, constructed with short blades and long handles; or with a hook and bistoury. The use of a cold astringent gargle will soon stop the bleeding.

Calculous concretions may be formed in the tonsils, and occasion troublesome coughing, sore throats, &c. The propriety of extracting them, when their existence is clearly ascertained, is quite obvious.

EXTIRPATION OF A PART OF THE UVULA.

When the uvula is permanently elongated, so as to interrupt swallowing, and occasion uneasiness in the throat, coughing, vomiting, &c. the redundant part of it should be removed with a sharp pair of scissars.

The fear of hemorrhage, and the recommendation of the ligature in these cases, still introduced in modern books, are absurd. Slight relaxations of the uvula yield to astringent gargles.

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* Œuvres de Desault par Bichat, tom. ii. p. 253.

CHAP. XXIV.

AMPUTATION OF THE LOWER JAW-BONE.

The frequent recovery of soldiers after the loss of the whole of the lower jaw, and extensive injury of many other parts of the face and throat by gun-shot violence, seems to have furnished the suggestion, that osteosarcoma, and some inveterate fungous diseases of the lower jaw-bone, incapable of cure, either with the knife or cautery, might be safely taken away, by amputating a more or less considerable portion of that bone. That the practice might be adopted with success, when the whole of the disease could be removed, and it was of a local nature, was first exemplified by Dupuytren, in November 1812. The case is described as one of cancer; osteosarcoma, and medullary exostoses, being generally regarded in France as carcinoma of the bones. The disease extended, first, from the second large grinder of the right side to the left ramus of the bone; secondly, from behind the lower lip to the root of the tongue; thirdly, from the lower alveolary arch to the upper, the two jaws being as widely separated as possible. The three grinders on the right side, the only teeth remaining, were buried in the tumour, from which there was a very fetid discharge. The bone was enlarged to thrice its natural size, and its interior was principally occupied by a sarcomatous mass, which had three projecting portions, one blocking up the mouth, and protruding out of it; the two others jutting out under different points of the cheek. The tongue was forced backward by the tumour, so that respiration and speech were rendered difficult. Mastication was also very painful, and, indeed, could scarcely be performed at all. No aliment could be introduced into the mouth, unless the right commissure of the lip were drawn to one side, away from the tumour. The saliva was poured out in great quantities; the glands of the neck were free from disease; and so was every part of the integuments. Notwithstanding repeated attempts to extirpate the disease, both with the knife and the cautery, it had been continually getting worse for fifteen years, that is to say, ever since its commencement; and the patient was now quite in a hectic state.

The following is the mode in which Dupuytren operated: M. Lisfranc compressed each of the labial arteries against the bone, near the lower part of the anterior edge of the masseter. Dupuytren took hold of the right side of the lower lip, with the thumb and forefinger of his left hand; while Breschet held the opposite side of this lip in the same manner. Dupuytren now made an incision completely through it, from the middle of its red border, and extended the cut as low as the os hyoides. The two flaps were then detached from the swelling; the utmost care being taken, however, not to separate any part from the bone that betrayed the slightest appearance of disease. The labial arteries, imbedded in the muscles, were easily avoided. The two flaps were then reflected outwards, and held by the assistants; while, with the view of more conveniently amputating the bone, Dupuytren detached its inner surface from the soft parts, with which it was connected. This was accomplished by carrying the scalpel along the inner side of its basis nearly as far as each ramus, where the saw was to be applied. The bone having been fixed, it was sawn through on both sides, one inch from its angles, by means of a small short saw provided with a handle. Hitherto the bleeding had been very trivial. The next measure consisted in dissecting away every particle of the disease about the root of the tongue: the bleeding that now arose was checked by the pressure of the fingers on the branches of the submental and lingual arteries, which were much larger than natural. At length, the trunk of the submental artery was tied, and the rest of the bleeding stopped with the cautery. Suffice it to add, that, in six weeks, the parts healed up so favourably, that the loss of the jaw-bone to the extent described, could not be suspected from the appearance of the face. Two small exfoliations occurred; but no disposition to tetanus ever showed itself, notwithstanding the laceration of the inferior dental nerves.

Dupuytren has proposed another method of performing the operation: the first incision has the same extent and direction, as that above specified. The external maxillary artery is then to be pushed backward over the edge of the masseter, when a scalpel is to be plunged into the soft parts immediately in front of the vessel, and an incision extended transversely until it joins the first. A third incision is to be made on the opposite side, in a similar manner. Thus, four flaps are produced, which are to be raised as far as their bases. This plan has the advantage of enabling the surgeon to expose more conveniently the whole body of the jawbone, and as M. Lisfranc observes, it should be preferred when a large portion of the bone is to be amputated. Dupuytren has demonstrated that, by this method, the lower jaw-bone may be sawn on a level with its rami, without the labial arteries being wounded.*

The remainder of this chapter must be limited to a notice of some peculiarities in the methods, adopted by other surgeons, who have had occasion to perform this operation.

Dr. Mott, of the United States, undertook it on a young woman, in November 1821, for a very similar disease to the preceding, but, occupying a still greater extent, and having adhesions to the soft palate, &c. As, in the proceedings which he contemplated, the principal branches of the external carotid would be wounded, he judged it most prudent to begin with putting a ligature round the carotid trunk, a step, which he thought would also tend to lessen the inflammation to be apprehended from the violence which would be unavoidably done to the tongue, palate, and pharynx. The carotid having been taken up, the removal of the jaw was postponed till next morning.

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* See Dict. des Sciences Med. t. xxix. p. 451.

An incision was begun over the condyloid process, opposite the lobe of the ear, carried down over the angle of the jaw in a semicircular direction, then along the lower part of the tumour, which rested upon the thyroid cartilage, and it ended on the chin, about half an inch beyond the angle of the mouth. The termination of this incision was just above the attachment of the under lip to the bone, and the mouth was laid open by it. Dr. Mott now extracted the second incisor tooth of that side, as it was in a sound part of the bone, and, after separating the soft parts from the side of the chin, and laying bare the bone, he introduced from within the mouth, through the wound, a narrow saw, about three inches long, resembling a key-hole saw, and thus divided the jaw-bone from above downwards.

The lower part of the tumour was then laid bare, by cutting through the mylo-hyoid muscle, and the flap of the cheek carefully separated and turned up. This fully exposed the whole extent of the tumour, as it rose upwards to the os malæ. After the integuments had been carefully dissected from the parotid gland, the masseter was detached from its insertion, until the edge of that gland was arrived at, when, after separating a thin layer of the fibres of the latter muscle, Dr. Mott readily raised the parotid without wounding it. The lower jaw-bone was now laid bare just below its division into two processes, and it appeared sound. To facilitate the sawing of the bone, it was necessary to make a second incision, about an inch long, close to the lobe of the ear, and terminating at the edge of the mastoid muscle. Then, with a fine saw, smaller and more convex than Hey's, Dr. Mott began to saw through the bone obliquely downwards and backwards, and finished with one less convex. The latter part of the sawing was done with great caution, to avoid the laceration of the inferior maxillary nerve. When the bone had been sawn through, the two processes were observed to be split asunder, and the coronoid to be drawn up by the action of the temporal muscle.

An elevator was now introduced into the division of the bone at the chin, by which means the diseased portion was raised. With a scalpel, passed into the mouth, the tumour was next separated from the side of the tongue, as far back as the posterior fauces, and also from the velum pendulum palati and pterygoid processes. In this manner it was so considerably loosened, that it could be turned upon the side of the neck. It was then separated from the parts below the base of the jaw, and from the pharynx; its detachment was also completed at the posterior angle, the operator carefully avoiding the trunks of the internal carotid, and deepseated jugular vein, which were both exposed.

The diseased mass, being thus separated above and below, was turned up, the pterygoid muscles detached, and the third branch of the fifth pair of nerves divided, from below, a little above the foramen at which it enters the bone.

In the operation, very little blood was lost. Only two large arteries, viz. the facial and lingual, were divided; but a smaller one, near the angle of the jaw, was tied. The flap of the cheek was brought down, and secured with sutures and adhesive straps. The patient recovered with little deformity.*

Dr. Mott's method seems calculated for cases, in which the tumour is of very great extent, though only one side of the bone itself is affected. The tying of the carotid was, perhaps, unnecessary.

In 1823, Dr. M'Clellan, of Philadelphia, amputated the body of the lower jaw-bone, affected with osteosarcoma. The whole of its substance, in front of its angles, was enormously enlarged, projecting downwards in front of the neck, and backwards into the throat, attended with an enormous swelling that extended upwards from the inner surface of the bone, and protruded outwards, so as to look exactly like an enlarged tongue. It rose above the molar teeth, pressed firmly against the roof of the mouth, and quite overlapped the incisors, which were concealed in its substance. Its posterior limits could not be discerned; but, on pressing it down with a spatula, the apex of the tongue could be seen resting upon it behind. Indeed the tongue was pushed nearly into the pharynx, and hence, the great difficulty of respiration and deglutition.†

Dr. M'Clellan made an incision through the integuments from the left commissure of the lips, obliquely downwards and backwards, and carried it over the anterior edge of the sterno-mastoid muscle, so as to command the carotid artery, in case it should become necessary to secure it on that side. The front edge of this incision was next raised, and the lower part of the tumour exposed. Having ascertained that the carotid need not be touched, Dr. M'Clellan dissected up the integuments forwards, until the whole surface of the tumour was exposed round to the opposite side. Paying no attention to the small arterial twigs, which were divided, he at once secured the facial artery, on each side, just where it emerged from the submaxillary gland. The bleeding from the small branches immediately ceased. He then dissected up the insertions of the masseters, a little way behind the tumour, and exposed the sound bone, which was now divided, on each side, with a metacarpal saw. The whole tumour was next turned outwards from the mouth, and carefully dissected from the under surface of the tongue, the submaxillary glands, and muscles on each side. A part of the sublingual glands, and a considerable portion of the left submaxillary, appearing unsound, were taken away. Only

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* See A. Burn's Surg. Anat. of Head. &c., ed. 1824, by Pattison.

† See Plate 6. fig. 1.

Plate 6.

Fig. 1.

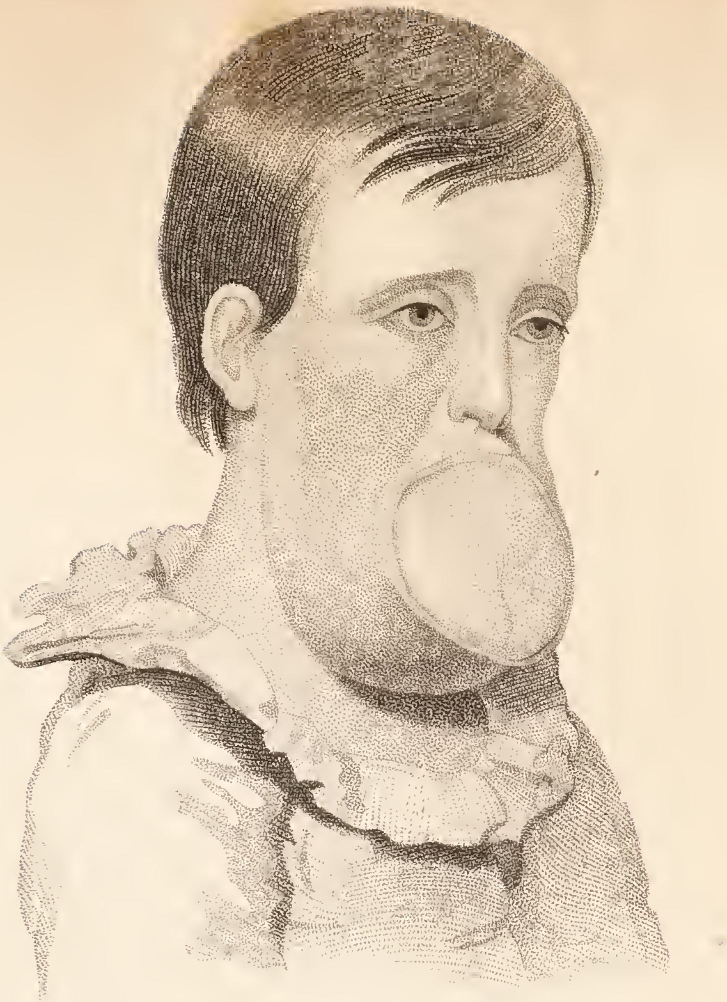
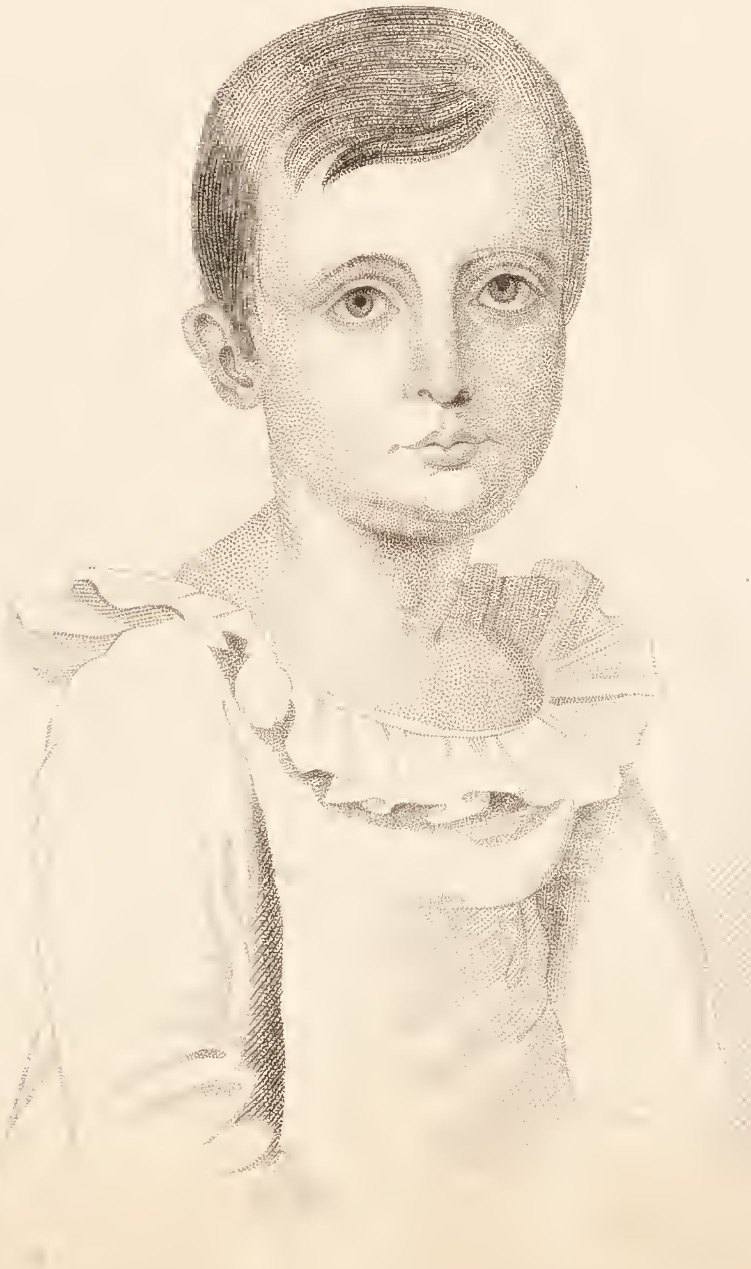


Fig. 2.



Published by Longman & Co. April, 1826.

three more arterial twigs required ligatures. Lastly, the flap was laid down in its natural situation, and kept there with sutures and adhesive plaster; the large cavity under the tongue being partly filled with lint, so as to support the loose skin. This operation, which reflects great credit on Dr. M'Clellan, was unfortunately followed by a return of one disease, of which the young patient (a girl six years of age) ultimately died. The degree, in which the deformity was temporarily removed, is shown in plate 6, fig. 2.

Dr. Cusack, of Dublin, has favoured me with some particulars of several cases in which he has operated. In a case resembling the disease described by Sir A. Cooper, under the name of medullary exostosis, he performed one operation. The left side of the bone was affected, from the angle to the canine tooth on the right. This tooth having been previously extracted, Dr. Cusack made an incision through the lower lip, beginning at its right commissure, and terminating half an inch below the basis of the jaw. The section of the jaw was next accomplished with a small hand-saw, through the vacant alveolary space. The second incision commenced at the lobe of the left ear, and extended in the course of the outer edge of the ramus as far as the angle. A third connected the first and second, being continued along the base as far as the angle. The flap, thus marked out, was dissected from the surface of the tumour, when the masseter was seen thin and expanded over the swelling. Its fibres were next divided, after which a correct estimate could be made of the extent of the disease. As the ramus appeared sound, its outer margin was sawn, midway between the angle and condyle. A needle was now passed closely behind this part of the bone, and a chain-saw drawn by means of it into the same place. With this instrument the sawing was rapidly effected. Dr. Cusack finished the operation by pressing downwards and forwards the tumour, and the loosened portion of the jaw, and dividing the muscles close to their connexions with the bone. A few dossils of lint were placed in the cavity, and the edges of the wound brought together with sutures and sticking-plaster. The bleeding was inconsiderable, no large vessels having been injured.

Dr. Cusack has removed large portions of the lower jaw in no less than four instances, the amputation having been performed in two of them at the joint itself. In doing this, he says, the preliminary steps were, in every respect, similar to those of the operation above-described. After dividing the anterior portion of the bone, however, he found the volume of the tumour such an impediment to the further proceedings, that he was obliged to make a second section above the angle. In one example, the ramus was divided, and the processes removed separately. In a second case, they were removed together. The condyle was removed by opening the front of the capsular ligament, forcing the condyle out, and making the requisite incisions for its separation with a blunt-pointed bistoury. Dr. Cusack has recently heard from the first patient, whom he operated upon in June 1824; she enjoys good health, but cannot chew solid food. In another case, where the chin was preserved, the patient enjoys full power of mastication. From the foregoing accounts, the surgeon may learn the various ways of effecting the removal of considerable portions, or, if necessary, even of the whole lower jaw-bone. The choice of a method must depend upon the circumstances of the case. The most simple is that adopted by Dupuytren, which seems well adapted for examples, in which only the central portion of the bone is diseased. When the disease extends far towards each ramus, the second plan, suggested by Dupuytren, would be eligible. When the disease is chiefly on one side of the face, but the tumour very large, and it is necessary either to saw the ramus high up, or to take the condyle out of its socket, the other methods, of which a description is given above, are entitled to consideration.

CHAP. XXV.

WOUNDS OF THE THROAT AND NECK.

In these cases, it is useful to recollect, first, that the arch of the aorta lies in the upper part of the chest, in front of the trachea, and that where the carotid arteries quit the chest to run up the neck, they are scarcely at the sides of the trachea, but rather in front of it. However, as they get higher, they incline to the side of this tube; and on their arrival near the angle of the jaw, where they begin to give off their branches to the head and neck, they even lie rather behind the side of the larynx. Hence, we see the reason, why a wound at the lower part of the neck is very often fatal, while one higher up is generally less dangerous. The suicide rarely strikes at the lower part of the neck, and it is from the accidental circumstance of his cutting very high up, near the chin, that the carotids escape.

It should be remembered, that the carotid artery, the great jugular vein, and eighth pair of nerves, lie very near each other, inclosed in a common sheath of cellular substance; that the eighth pair are nerves of the highest importance, because they are distributed to organs, whose functions are essential to life; and, consequently, that a wound of these nerves is more perilous than a wound of the brain itself. Such an injury, as Mr. John Bell has observed, would generally settle at once all questions about the way of managing wounds of the carotid artery, or of the great vein.*

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* See John Bell's Discourses on Wounds, edit. 3. p. 415.

I would not assert, as Mr. John Bell has done, that it is impossible to cut through the trachea, without wounding the carotid artery, the jugular vein, and the eighth pair of nerves; but, I fully join him in the belief, that such an accident cannot be frequent. How then are we to explain the many cures, which are alleged to have taken place, notwithstanding a division both of the windpipe and of the œsophagus? We are to account for some of these extraordinary narratives in the manner pointed out by the preceding writer. "The fact is, that neither the œsophagus, nor the trachea, is touched in the least degree, but the wound is much above them, for a suicide always strikes immediately under the chin. This wound, as far as I have observed, commonly falls in the line which divides the neck from the chin, that is, the place were the os hyoides lies, and he commonly cuts the os hyoides away from its connection with the thyroid cartilage, or pomum Adami. In that case, the thyroid cartilage, forming the uppermost part of the larynx, is not touched; the rima glottidis lies below the wound quite safe. It only separates the larynx from the root of the tongue; it is properly a wound in the root of the tongue; it is rather a wound of the mouth, than of the throat; and when the food comes out, along with spittle and froth, it is by rolling over the root of the tongue." *

That both the trachea and œsophagus, however, may be sometimes cut without the par vagum, or large blood-vessels being hurt, is a fact, which my own observations will not permit me to doubt. I have seen more than one instance, in which the wound was situated much lower, than the point mentioned by Mr. John Bell, and yet both air and food issued from the cut. But, if I were mistaken in the nature of these accidents, still many facts of the same kind, recorded by able and judicious surgeons, prove the possibility of a wound both of the trachea and œsophagus, without injury of the par vagum, carotid, or internal jugular vein. †

In wounds of the upper part of the throat, it is the superior thyroid artery that is most frequently cut. After quitting the external carotid at the angle of the jaw, it passes along the side of the upper part of the trachea, inclining forwards towards the thyroid gland in its descent, and hence its great exposure to the edge of the razor. The bleeding from it is profuse, and, if not speedily stopped, is as fatal as hemorrhage from the carotid itself. In some cases, the bleeding also proceeds from the lingual artery, or its branches.

The carotid artery has now been so frequently tied with success, and the best way of taking it up is so well known, that I shall not expatiate upon these topics again; but merely refer to the chapter on aneurism. The necessity of instantly tying this vessel, when wounded, is unquestionable, as well as the occasion for two ligatures,

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* On Wounds, edit. 3. p. 417.

† Desault's Journal; Saviard, Obs. 58.; Hennen's Obs. on Military Surgery, p. 386, &c.

one above, the other below, the aperture in the artery. Unfortunately, so rapid and profuse is the bleeding, that the patient mostly dies in a few seconds, before any surgical assistance can be obtained.

According to Richter, the internal jugular vein has been tied with success; and small wounds of it may be healed by means of a graduated compress, retained on the part with a bandage, or, if that prove irksome, with the finger. One thing, however, is essential; namely, the pressure must on no account be discontinued before the wound in the vessel is closed. *

Pelletan once saw a wound of the throat, which proved fatal in consequence of hemorrhage from the external jugular veins; and another curious instance, in which a boy, who was convalescent after a cut of his throat, suddenly fell down in a state of suffocation, and died: dissection showed that the left side of the epiglottis had been detached from the glottis and root of the tongue, and that in this loose unconnected state, it had fallen into the rima glottidis, and caused instantaneous suffocation.†

Wounds of the trachea are either simple or complicated. In both cases there is an emission of air from the wound, loss of the voice, and sometimes emphysema. Injuries of the windpipe, not complicated with hemorrhage, emphysema, or loss of substance, are generally easy of cure. If the wound be of a certain size, and attended with hemorrhage, the first indication is to tie the bleeding vessels, and prevent the inconvenience and danger ‡ which would result from the entrance of blood into the windpipe. With this view, some authors recommend us not to close the external wound while any oozing of blood continues, so that this fluid may readily be discharged. § At all events, the most useful measures for this purpose are tying any large bleeding vessels, and bringing the edges of the wound in the trachea into contact by a suitable position of the patient's head, and, if requisite, even by a suture.

The greater sensibility of the larynx, its complicated structure, and the number and size of its blood-vessels, render wounds of it more dangerous, than those of the trachea. They produce more irritation, and are generally attended with a convulsive cough. In general, however, simple wounds of the thyroid cartilage heal favourably.

Transverse wounds, only extending through the front half of the upper part of the trachea, generally end well; for they mostly leave nerves and vessels of consequence untouched. Loss of voice; the entrance and exit of air through the wound; and sometimes an emphysematous swelling; are immediate consequences of the injury. Wounds of this description, made by gunshot violence, are

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* Anfangsgr. der Wundarzneykunst, b. 4. p. 175.

† Levéillé, Nouvelle Doctrine Chirurg. t. i. p. 542.

‡ See Wilmer's Cases and Remarks in Surgery, p. 92.

§ Lassus, Pathologie Chirurgicale, t. ii. p. 291.

of a more serious nature; but even they not unfrequently terminate well. In most instances, transverse wounds of the trachea, not dividing it completely through, may be cured by bringing the patient's chin downward and forward towards the sternum, and maintaining the head in this posture with pillows, by which means the edges of the wound in the trachea will be kept in contact. However, when the division of the trachea is extensive, a suture may be employed with advantage. In the opposite circumstance, it should be dispensed with as unnecessary, and aggravating the cough, with which the patient and the wounded parts are generally disturbed. When the severity of this symptom is owing to an inflammatory state of the wound, it may be mitigated by bleeding and soothing remedies. When it appears chiefly to depend upon a copious secretion of mucus in the larynx, or trachea, the almond emulsion, spermaceti mixture, and opium, may be given with beneficial effect.

In order to prevent the discharge and blood from falling into the trachea, a circumstance that always excites violent coughing, some practitioners direct the patient to lie on his side, with his face turned downwards.* However, nothing prevents these occurrences more effectually, than keeping the edges of the wound accurately in contact; and the patient's head may be much more steadily supported forward, when he lies on his back, than when he is on his side.

When the upper portion of the trachea is detached from the lower, and the wound is not immediately fatal from injury of other important parts, the bleeding vessels are first to be tied, and the two ends of the windpipe brought together. Here the employment of a suture is warrantable, on account of the considerable separation of the parts, and the inefficacy of position alone to prevent it. A flat broadish ligature should be employed; the needle should not be introduced through the lining of the trachea; and if the chin be kept moderately inclined towards the breast, one stitch will suffice.

When the whole diameter of the trachea is cut through, the French surgeons propose the introduction of a flexible catheter, from one of the nostrils, into the larynx and trachea, in order to insure a passage for respiration, which, they say, without this means, is liable to be intercepted when the outer wound is closed, in consequence of the two portions of the windpipe being separated and not corresponding.† This, however, is not the practice to which I should give a preference; first, because the introduction of a flexible catheter is not always easy of accomplishment; secondly, because its use in this way is constantly productive of considerable irritation; and, thirdly, because the employment of a suture appears a better means of preserving a passage for the air, by keeping the ends of the trachea together.

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* Mém. de l'Acad. de Chirurgie, t. i. p. 581.

† Richerand, Nosographie Chir. t. iv. p. 170. edit. 4.

With respect to the introduction of a flexible catheter, from one of the nostrils into the œsophagus, for the purpose of giving food and medicines, without disturbance of the wounded parts, I consider the method entitled to praise, in all very bad wounds, either of the larynx, trachea, pharynx, or œsophagus; for, in deglutition, the sudden and almost convulsive action of the muscles, concerned in the elevation and depression of the larynx, has the worst effect in preventing the favourable union of the parts. But, if nourishment and medicines be injected down the œsophagus through an elastic catheter, this hurtful action of the muscles is entirely prevented. I have seen the instrument left in the œsophagus, in several cases, without any annoyance or irritation; and the requisite medicines and nourishment were given with the utmost convenience. The military surgeon, in particular, should never be without several of these catheters; and whoever has read Larrey's instructive work,* must know, that, in bad wounds of the throat, the patient's only chance of recovery frequently depends upon the skilful use of these instruments.

Gunshot wounds of the neck, lacerating the trachea, frequently terminate well.† Ravaton mentions instances, which were also followed by a recovery of the voice. To these cases sutures are not at all applicable. The adoption of the position above recommended, and the application of simple dressings, or an emollient poultice, contained in a fine linen bag, are the chief local measures. Bleeding, and antiphlogistic remedies of every description, will be generally proper. Opium is not to be forgotten, as an useful medicine; for it not only appeases the cough, but tends to quiet the great mental and nervous anxiety, which, in examples of attempted suicide, precede the wound, and generally continue after it in a very aggravated degree. Indeed, many of the unhappy persons, who attempt to destroy themselves by cutting their throats, retain for a good while after the failure of the first attempt a determination to take another opportunity of accomplishing their fatal purpose. Hence, they cannot be too closely watched, and nothing like a razor or knife should ever be put within their reach. Vigilance is also necessary, in order to keep the dressings from being displaced, and the wound torn open again, by the restless movements, or actual violence of the patient.

Schmucker treated small wounds of the pharynx and upper part of the œsophagus with success. Wounds dividing half, or even two-thirds of the tube, are also stated to have been cured.‡ The possibility and impossibility of a cure must obviously depend upon the nature of the other parts, which happen to be injured.

Incised wounds of the forepart of the œsophagus, must derive additional danger from the simultaneous division of the whole circle of the trachea; and indeed, so much would the internal jugular vein, par vagum, and carotid artery be exposed to the edge of the knife in a cut of this kind, that it is difficult to conceive how they can ever escape. Mr. John Bell believed that they never could; and were it not for a few cases which I have seen myself, and for some examples published by Desault, whom we cannot suppose apt to mistake a wound of the mouth for one of the trachea and œsophagus, I should be inclined to adopt Mr. J. Bell's opinion. However, a punctured wound, penetrating the side of the œsophagus, may not be complicated with injury of the trachea.

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* Mém. de Chir. Militaire, 4 tomes, 8vo.

† Mém. de l'Acad. de Chirurgie, tom. i. p. 576. 4to.

‡ Op. cit. tom. iii. p. 151, &c. edit. 12mo.

Should the case be one that leaves the great vessels uncut, though the injury of the œsophagus be complicated with a complete division of the trachea, the surgeon may lessen the space between the edges of the wound in the œsophagus, by bringing the divided portions of the trachea together. This effect must result from the manner in which the posterior part of the windpipe is connected with the œsophagus. But, for this purpose, a suture is only to be used in such a state of the wounded trachea as has been already mentioned, and in all other cases a proper position of the head, and the use of adhesive plaster to the external wound, are the means with which the surgeon ought to be content.

In cases of wounds of the œsophagus, the injection of nourishment and medicines, through a smooth tube of a suitable size, introduced down the passage, was recommended as long since as the time of Ravaton. In one case of paralysis of the œsophagus, that occurred in this country, a small fresh eel-skin was passed down the canal, by means of a whalebone probang, in order that nourishment and medicines might be injected into the stomach.* The many cases, however, in which Desault advantageously employed an elastic catheter for the same objects, had a principal influence in establishing the practice. The instrument was introduced through one of the nostrils, and was often left in the œsophagus several days together. †

Sometimes this practice is absolutely necessary in complicated wounds about the face; like those produced by the discharge of a pistol in the mouth, attended with extensive laceration of the tongue, cheeks, and fauces, great swelling of all the parts about the throat, and a comminuted fracture of the lower and upper jaw-bone. I believe, indeed, that in all bad fractures of the lower jaw, the introduction of a flexible catheter, from one of the nostrils into the œsophagus, is a judicious measure, because the action of deglutition has the worst effect in displacing the broken bone, and disturbing the process of union.

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* Hunter, in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge.

† See the Journ. de Chir. and Bichat's Œuvres, Chir. de Desault, tom. ii.

Gunshot-wounds of the neck sometimes occasion an immediate loss of the use of the arm on the affected side; a circumstance depending upon injury of the cervical nerves.

Deep sabre-cuts of the muscles at the back of the neck are sometimes followed by a paralytic weakness of the lower extremity, corresponding to that side of the body on which the wound is situated. In some instances, the limb becomes emaciated; in others, it is well nourished. Flajani first particularly pointed out the occurrence, as common after such wounds; and many examples of it are recorded by Larrey. In two cases, Flajani tried issues in the loins, liniments, and the internal exhibition of the tinctura lyttæ, but without success.* In some of Larrey's cases, the wounds were followed by a wasting of the testicles, and an entire loss of all venereal desire.

CHAP. XXVI.

FOREIGN BODIES IN THE ŒSOPHAGUS,

Requiring extraction, are such as might create bad symptoms, if pushed down into the stomach, in consequence of their hardness, indissolubility, pointed shape, or other hurtful qualities. On the other hand, those which are not likely to produce harm in the alimentary canal, and are capable of being digested, may be at once pushed down into the stomach.

Foreign bodies most frequently lodge about the upper or lower orifice of the œsophagus; seldom in its middle portion. When low down, the surgeon is often compelled to force them into the stomach, though their quality is such as would render their extraction desirable. In many instances, they are situated in the pharynx. Hence, it is an important rule, always to press down the tongue, and examine the back of the throat, before any thing else is attempted. Thus, they may frequently be discovered, and extracted with the fingers, or forceps, when, from the patient's account, one would conjecture that they had descended much further.

When a foreign body is situated about the upper orifice of the œsophagus, it may often be felt with the surgeon's finger, and if incapable of being removed with it, it may sometimes be extracted with a pair of curved forceps.

A common extracting instrument is a kind of hook, constructed of flexible wire, so doubled, and twisted together, that the bent end forms a noose, in the shape of a hook.

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* Collezione d'Osservazioni et Riflessioni di Chirurgia, tomo i. p. 46, &c.

Small bodies, like needles, fish-bones, &c. are generally more easily extracted with a piece of sponge, introduced beyond them. The art of employing compressed sponge, in the most advantageous manner, consists in taking a piece about the size of a chesnut, and introducing a strong ligature through it. The ends of the ligature are then to be passed through a flexible catheter, and fastened to that end of it which the surgeon holds. The sponge is then to be introduced down the œsophagus beyond the foreign body, and water is to be injected down the tube, in order to wet the sponge and make it expand. The ligature is then to be firmly drawn, for the purpose of pressing the sponge against the extremity of the tube, and making it spread itself out in a still greater degree. The tube is now to be withdrawn, together with the sponge, the instrument being twisted to the right and left, in this part of the operation.

When the foreign substance cannot be extracted with this instrument, a probang may be tried, to the end of which a bunch of thread is fastened, doubled so as to make an immense number of nooses. In this way, little bodies frequently admit of being entangled, and extracted, when other modes fail.

Some practitioners are in the habit of giving emetics; but this method must be improper when the foreign body is pointed, and is seldom of much use in any case, as patients usually make efforts to vomit of their own accord.

When the foreign bodies produce urgent symptoms, and cannot be extracted, it becomes necessary to push them into the stomach, whatever may be their nature or quality; and here it should be mentioned, that substances which one would imagine likely to produce alarming symptoms by being put into the stomach, frequently occasion, after they are in that organ, no dangerous symptoms, and even not the smallest inconvenience. A whalebone probang is the instrument for this purpose.

When foreign bodies can neither be extracted, nor pushed down, the consequences are not invariably dangerous. When the extraneous substance is small and pointed, it frequently excites suppuration, becomes loose, and is either carried into the stomach, or ejected from the mouth. Sometimes it makes its way to the surface of the neck, occasioning there an abscess, out of which it is extracted.

In some instances, foreign bodies, especially needles and pins, after making their way through the œsophagus, travel a great way about the body, and, at length, arrive under the skin of remote parts, behind the ears, at the shoulders, feet, &c. where they occasion an abscess, that leads to their discovery and extraction. Surgical authors have recorded a variety of examples, in which pins and needles, after being swallowed, have continued in the body many years. In one instance, in particular, a needle that had been swallowed, remained in the body eighteen years before it made its appearance under the skin, during all which time not the slightest inconvenience was experienced.*

When the foreign body is large, it totally impedes deglutition, dangerously obstructs respiration, and can neither be pushed down into the stomach, nor extracted by the mouth, the only means of saving the patient's life is œsophagotomy; an operation that has rarely been performed on the living subject. It is directed by Lisfranc to be done as follows: the patient's head having been inclined backwards, an incision is to be commenced at the inner edge of the left sterno-mastoid muscle, opposite the superior edge of the thyroid cartilage, and continued down to the lower edge of the cricoid. An assistant is now to draw the carotid sheath towards the outer side of the wound, while the operator cautiously dissects through the cellular substance close to the trachea, until the œsophagus is exposed, where it inclines to the left side of the windpipe. A long, slightly curved cannula, with a grooved stilet, is now to be introduced from the mouth down the œsophagus, and its point, being inclined to the left, may readily be felt in the wound. The stilet is then to be pushed forwards through the œsophagus; the operator ascertains, by passing his finger along the concave end of the instrument, that no arterial branch lies over it; and then puts a bistoury into the groove, under the guidance of which the œsophagus is opened. The foreign body, lodged in this canal, is now to be extracted with a pair of forceps.*

CHAP. XXVII.

OF LARYNGOTOMY AND BRONCHOTOMY.

Sometimes, the only chance of life depends upon an opening being made in the larynx, or trachea, without the least delay, either for the purpose of extracting foreign bodies from the larynx threatening suffocation, or of enabling the patient to breathe, until some existing impediment to the natural mode of respiration has been removed. The first of these operations is termed *laryngotomy*, a method which, though not generally preferred in this country, has had several distinguished advocates on the continent, especially in France. It consists in making a transverse incision through the crico-thyroid membrane, or in slitting open the thyroid cartilage longitudinally. The making of an opening in the trachea is named

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* See Précis d'Observations sur les Corps Etrangéres Arrêtés dans l'œsophage, &c. par M. Hevin, in Mém. de l'Acad. de Chir. tom. i. 4to.

† See Averill's Short Treatise on Operative Surgery, p. 49.

tracheotomy or *bronchotomy*, and is sometimes executed by making an incision between two of the rings of the trachea, parallel to them; but, generally, by making a perpendicular division of them.

Writers, who give the preference to laryngotomy, offer the following considerations in its favour: the only parts cut are the skin, cellular substance, and crico-thyroid membrane; the little risk of hemorrhage, a few small veins, and the superior laryngeal artery, being the only vessels exposed to the knife; the greater facility with which the larynx is fixed, than the trachea, which, being more deeply situated and moveable, may slip away from the knife, and even the carotids be wounded; an instance of which is related by Bichat.

As to the question, which operation is most suited to the objects in view, Bichat endeavours to prove that laryngotomy always answers as well, and sometimes better than tracheotomy. If the design be merely to make an opening for the air, one situation will do as well as the other. If the extraction of a foreign body be the object, laryngotomy must evidently be the most applicable, supposing the substance to be lodged between the edges of the glottis, or in the ventricles of the larynx.

While Ferrand was surgeon of the Hôtel Dieu, a man was brought to it with urgent symptoms of suffocation, caused by a stone that had fallen into the glottis. Tracheotomy was performed, but merely a little blood and mucus was discharged. The patient died, and on examination, a triangular stone was found, two angles of which were lodged in the ventricles of the larnyx, while the other projected at the glottis. In this example, laryngotomy would have saved the man's life. When a foreign body in the trachea is loose, it is mostly at the upper part of it; but, if it should happen to be fixed, and lower down, the advocates for laryngotomy assert, that it may even then be readily extracted, by extending the cut through the cricoid cartilage, and using a pair of curved forceps.

Whatever differences of opinion may be entertained, however, respecting the advantages of laryngotomy in examples of foreign bodies in the larynx, none can exist in cases of deeply seated tumours between the trachea and œsophagus; a foreign body far down the latter passage; or obstructed respiration from the swelling attendant on severe wounds of the throat: here tracheotomy is alone applicable. I also agree with Flajani in condemning laryngotomy, in croup and angina, because the wound should be made away from the seat of inflammation.*

When laryngotomy is preferred, and making an opening to enable the patient to breathe, is the only object, a transverse incision in the crico-thyroid membrane will suffice. The skin being made tense, and the larynx fixed, the skin and cellular substances are to be divided to the extent of an inch, from the lower part of the thyroid to the cricoid cartilage, between the two sets of sterno-thyroidei and sterno-hyoidei muscles. The surgeon is then to dissect carefully down to the membrane. The puncture should be made rather towards the cricoid cartilage, so as to avoid an arterial branch, which usually runs along the lower edge of the thyroid cartilage. Should the bleeding from any vessel prove troublesome, a ligature ought to be applied. Lastly, a short flat silver tube is to be introduced, and being covered with a bit of gauze is to be fixed in its place with ribands. Care must be taken to withdraw and clean it as often as it becomes obstructed with mucus. Instead of a tube, the removal of a thin slip of the membrane, as suggested by Mr. Lawrence with regard to the trachea in bronchotomy, might be a more convenient practice for the purpose of insuring a sufficient temporary opening for respiration.

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* Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, t. iii. p. 241.

When laryngotomy is performed for the extraction of foreign bodies, a scalpel, director, a straight and a curved pair of forceps, are the requisite instruments. The skin and cellular substance are first to be divided, from the upper part of the thyroid, to the base of the cricoid cartilage. The membrane, between these two parts, is to be opened, and a director being passed into the aperture, the front of the thyroid cartilage is to be slit open. On the edges of the wound being now separated with the forceps, the foreign body, if it be loose, will immediately escape with the air. Should it be fixed, it must be taken out with the curved forceps. When it is engaged in the glottis, it will be most convenient to push it upwards into the mouth. When it has passed far into the trachea, the extraction may be difficult, unless the wound be enlarged by dividing the cricoid cartilage.

In old persons, the cartilages of the larynx may be ossified, and difficulty may be experienced in dividing them; nor can the thyroid cartilage be slit open, without some risk of injuring the chordæ vocales. In cases of cynanche laryngea, the thickened and swelled state of the lining of the larynx*, and the impropriety of cutting the inflamed parts themselves, are strong objections to this mode of operating, which is not more eligible when the object is to inflate the lungs.

The following is the common method of performing bronchotomy. When a free opening in the trachea is requisite, an incision may be made in the integuments, beginning just below the inferior lobes of the thyroid gland, and extending directly downwards about two inches. Each sterno-thyroideus muscle is then to be pushed a little towards its own side of the neck, and a longitudinal wound, of the necessary size, is to be made in the front of the trachea. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood-vessels; and the incision ought never to extend too near the first bone of the sternum, lest the subclavian vein be wounded.

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* Med. Chir. Trans. vol. vi. p. 249.

When the design of the operation is merely to make a passage for the air, the incision in the trachea need not exceed half an inch in length. In some cases, the introduction of a tube into the opening produces such irritation as cannot be endured: in this circumstance, Mr. Lawrence recommends the removal of a thin slip of the trachea, which will leave an artificial opening sufficient for respiration.

CHAP. XXVIII.

WRY-NECK.

In this complaint the head is drawn towards one of the shoulders. In general, the face is turned towards the opposite side; but, occasionally, towards that to which the head inclines. The affection, when in a high degree, renders the head quite immoveable, so that neither the patient, nor any other person, can place it in its proper position. Hence, when the patient wishes to look in any direction, except immediately before him, he is necessitated to turn his whole body. Sometimes the head can be moved, but not brought into a straight posture. In other instances, the patient, with exertion, can manage to keep his head straight for a short time; but it soon becomes inclined again towards the shoulder.

Generally, on the side towards which the head leans, the neck seems plump, the strong shortened muscles being bulky, and affected with considerable spasm; while the other side, where the neck is convex, exhibits no strong rigid muscles, or, at all events, so little of this appearance, that, notwithstanding its convex form, it is obviously less fleshy. When the disease has continued long, and attained a serious degree, its effects extend to the head. On the side, where the irregular action of the muscles is strongest, and where consequently the head is most drawn downwards, the half of the face is usually more or less contracted, and weaker than the opposite half, the zygomaticus major, buccinator, masseter, and other muscles, being considerably less prominent.

The complaint is usually owing to a defect in the muscles concerned in moving the head. When, however, the deformity has existed a long time, and particularly, when it began in early childhood, and continued during the growth of the body, the cervical vertebræ are sometimes distorted, and even anchylosed, in which circumstances, the case may be deemed incurable. This participation of the vertebræ in the disorder, does not always exist, even though the deformity may have begun at an early period of life, and prevailed a considerable time. Richter mentions several instances, in which wry-necks of the most unpromising description were cured; cases, in which the head had been quite immoveable; the disease of twelve and sixteen years' duration; and its origin had taken place in infancy.* Professor Jörg †, of Leipsic, assures us, that he has never seen any cases in which the complaint originated in the bones: the muscles were always the parts first concerned. According to his observations, the sterno-cleido-mastoideus is to be looked upon as the chief and original cause of the deformity, which he has never seen unattended with the particular and manifest influence of that muscle. While, says he, it is more disposed to irregular action than any other muscle of the neck, its greater strength makes it in some measure govern the rest.

The same writer does not give much credit to the opinion, that wry-neck is frequently brought on by a contraction of the skin of the neck, and of the platysma myoides; although we know, that Mr. Gooch effected a cure by simply dividing these parts: but Professor Jörg thinks, that when these textures, or any other muscles of the neck are shortened, it is generally as a consequence of the affection of the sterno-cleido-mastoideus, which is the part originally disordered. With the exception of cases, produced by the contraction of cicatrices, Jörg's sentiment is probably correct. With respect to a malformation of the cervical vertebræ being the primary cause of wry-neck, this author does not deny its possibility; but he has never seen an instance of it.

When the deformity follows the contraction of a cicatrix, the cure is by no means easy. A transverse incision is made through the integuments, and the head is afterwards kept in a straight posture by some mechanical contrivance, until the wound is perfectly healed. The apparatus is left off, and the distorted position of the head returns, as surely as the granulations, by which the new wound has been filled up, are absorbed. Whether the entire removal of the first scar, as suggested by Mr. Earle, or the modification of this treatment, since tried and recommended by Mr. James, of Exeter, will have better success, further experience must determine. In some instances of children, in whom the chin was nearly in contact with the breast, in consequence of the effect of severe burns, I have known considerable amendment follow the division of the longitudinal folds in the cicatrized parts.

In common examples, depending chiefly upon a loss of equilibrium between the muscles of the opposite sides of the neck, and especially upon a rigid contraction of one of the sterno-cleido-mastoidei, the usual means, which sometimes succeed, are camphorated mercurial frictions on the part, even till salivation occurs; the internal exhibition of opium, together with mercurial frictions;

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* Anfansgr. de Wundarzn. b. iv. p. 276.

† Ueber die Verkrümmungen des Menschlichen Körpers, und eine rationelle und sichere Heilart derselben. 4to. Leipzig, 1816.

electricity; stimulating embrocations; the shower-bath; blisters; issues, &c. These remedies should be assisted with mechanical contrivances, for gradually bringing the head into a straight position. The best apparatus, which I know of for this purpose, is that invented by Professor Jörg. It consists of a pair of leather stays, and of a band, or fillet, which goes round the head. On the centre of the forepart of the stays is a kind of pulley, or grooved wheel, which can be turned round with a key in one direction, but not in the other, as it becomes fixed by means of a spring. From this pulley, or wheel, a band proceeds up the neck to the fillet on the patient's head, to which it is fastened directly behind the ear, close to the mastoid process. The band lies in the same direction as the lengthened sterno-cleido-mastoideus muscle, and when drawn towards the breast by means of the wheel, it produces the same effect as would arise from an increase in the action of that muscle. In short, it pulls the mastoid process downwards and forwards towards the sternum, counteracts the opposite muscle of the same name, and rectifies the position of the head. The apparatus is to be constantly worn.

When, by perseverance in the use of this simple invention, and other means, the position of the neck has been improved, the head is generally found to have a disposition to incline too much forwards; an effect, which the contracted sterno-cleido-mastoideus, and its antagonist, the band, both tend to promote. In order to hinder this, Professor Jörg removes the end of the band from the breast, carries it under the arm, and through a ring at the side of the leather corsets, or stays, and thence to the fillet on the head, where it is fastened close to the mastoid process. The ring hinders the band from chafing the axilla, and following the motions of the shoulder.*

It is when the disease originates from a contraction of the muscles on one side of the neck, quite unattended with the smallest perceptible induration, that an operation is advised for dividing the contracted muscular fibres. This, however, must only be performed when the wry-neck depends entirely, or principally, on a contraction of the sterno-cleido-mastoideus. When the defect is situated in the other muscles, or the cervical vertebræ are altered, the operation is not advisable. When the above muscle is alone, or chiefly concerned, the face is always turned from that side to which the head is inclined; and in endeavouring to put the head in a straight position, the fibres of the muscle are rendered exceedingly tense.

Should Sharp's operation of dividing the sterno-cleido-mastoideus be determined upon, it will generally be prudent at first only to cut through the clavicular portion of it. If the surgeon should determine to cut out a part of the fibres, the incision must be made through the skin, exactly in the direction of this portion of the sterno-cleido-mastoideus. If he means simply to divide it, a transverse wound will suffice. On this part of the muscle being completely exposed, the rest of the operation is to be completed by passing a director, and blunt-pointed curved bistoury, under the place where the division is intended to be made. If a part of the muscle is to be removed, the operator may finish the operation with a pair of forceps, and a common knife. Dupuytren, in one case, passed a bistoury behind the muscle and divided it by cutting forwards, leaving the skin uncut, in order that the patient, who was a female, might not have the disfigurement of a scar in the neck. The position of the head was then regulated by a bandage. The plan was successful.

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* Plate 4. Fig. 4. Professor Jörg's apparatus applied.
Fig. 5. Back View of the leather stays.
Fig. 6. Key for turning the pulley.

A wry-neck may depend on paralysis, or weakness, of one sterno-cleido-mastoideus, while the other retains its natural power.

Here electricity, setons, blisters, liniments, the cold bath, and tonics, are indicated. The state of the bowels and digestive organs should also be carefully regulated. During the trial of these remedies, the head should be kept in a straight position, as paralytic muscles are more likely to recover their tone in a tense, than a relaxed state. When such treatment fails, a partial division of the healthy sterno-cleido-mastoideus has been suggested, as a means of restoring the equilibrium of the head.

CHAP. XXIX.

BRONCHOCELE,

Signifies an indolent enlargement of the thyroid gland; the tumour, when not accidentally inflamed, is free from pain; and in its incipient state, has a soft, elastic consistence. When it has existed some time, the gland loses its natural figure, assumes a firm fleshy feel, being firmer, however, in some places, than in others, spreading towards the sides of the neck, and sometimes attaining a prodigious magnitude. When the adjacent cellular substance, and lymphatic glands, participate in the disease, the base of the swelling may extend from one side of the neck to the other. In a few instances, only one lobe is affected.

Bronchocele is endemic in several mountainous countries; for instance, Switzerland, Savoy, the Tyrol, Derbyshire, &c.; and is most frequent in young females.

When a section is made of the diseased thyroid gland, it appears to consist of many cells of different sizes, filled with a transparent viscid fluid.*

The tumour sometimes creates no particular inconvenience; and is merely a deformity. Large bronchoceles, however, are frequently attended with considerable obstruction of the speech, respiration, and deglutition. The disease has no tendency to become malignant, and is not very liable to inflammation and its consequences, though these changes sometimes happen.

The causes of bronchocele are involved in great obscurity. At one time, it was conjectured, that drinking water, obtained from melted ice or snow, frequently gave rise to the disorder. The disease, however, is frequent in Sumatra, where ice and snow are never seen; while it is entirely unknown in Thibet, where the rivers are exclusively supplied by the melting of the mountain's snow.† Bronchocele has been regarded as a scrofulous complaint; but this doctrine is denied by Prosser, who argues, that the disease is often seen in persons entirely free from every mark of scrofula; and that, while boys are as subject to scrofulous diseases as girls, the bronchocele of this country occurs only in young females.‡

The disease, in a recent state, may frequently be cured; but, when it has existed a long time, though it may be considerably diminished, it can hardly ever be entirely removed.

The medicine, commonly given in bronchocele, used to be burnt sponge, in the dose of a scruple, two or three times a day. Sometimes, it was made into an electuary with syrup; but, frequently it was prescribed in the form of a lozenge, the efficacy of which was thought to be greatest, when it was placed under the tongue, and allowed gradually to dissolve there. A mercurial purgative was usually given about once a fortnight.§

The good effects of burnt sponge have now been ascertained to depend upon the iodine, which it contains. Dr. Coindet, of Geneva, has employed various preparations of the latter substance with far greater success, than ever resulted from the use of other medicines. From five to twenty drops of the tincture may be given to an adult, three times a day. Dr. Coster, who had opportunities of noticing Dr. Coindet's practice, informs us, that the efficacy of iodine is promoted by the previous application of leeches to the swelling, and a low regimen.‖

With such treatment, external means are to be combined; as repeated frictions of the swelling with a dry towel, strong liniments, or, what is still better, the iodine ointment. Electricity and galvanism may also prove useful auxiliaries to the other means.

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* Baillie's Morbid Anatomy of some of the most important Parts of the Human Body, p. 84. edit. 2.; also, Prosser on Bronchocele, or Derby-neck, p. 18., edit. 3.

† See Sketches of the Philosophy of Life, by Sir T. C. Morgan, M. D. p. 426. 8vo. Lond. 1818.

‡ An Account and Method of Cure of the Bronchocele, or Derby-neck, 3d edit. p. 5. 4to. Lond. 1782.

§ See Wilmer's Cases in Surgery.

‖ Archives Gen. de Med. Juillet, 1823.

Accident has sometimes furnished useful suggestions in the practice of surgery: bronchoceles have occasionally festered, or ulcerated, and the result sometimes been the dispersion of most of the swelling. Hence, the plans of forming issues and setons, as a mode of cure. Valuable information, respecting the effects of setons, may be collected from a paper by Dr. Somerville, describing the practice of Quadri at Naples, and inserted in the Med. Chir. Trans. vol. 10.; and from another paper in the eleventh volume, drawn up by Mr. Copland Hutchison. It is evident, that the trial of a seton should never be made, except when iodine has decidedly failed, and the complaint is beginning to be oppressive by its size.

If this latter measure, or the formation of an issue, should not be deemed advisable, and the patient's life be rendered miserable, or seriously endangered by the pressure of the swelling on the trachea, œsophagus, and veins returning the blood from the head, it will be for the practitioner to consider, whether he will imitate Walther, of Landshut, and Mr. Coates, of Salisbury, in tying one or both of the superior thyroid arteries, or follow the example set by Gooch, Desault, Theden, Vogel, and Hedenus, who ventured to extirpate the enlarged thyroid gland. The latter distinguished surgeon, residing at Dresden, has performed this bold operation, at least six times, with complete success. The most essential rule in the operation would be to secure every large artery directly it was cut, so that the patient might not be lost by hemorrhage, ere the complete detachment of the swelling was effected. Now that the right method of tying large arteries is better understood, than formerly, secondary hemorrhage would not occur with the frequency exemplified in Gooch's cases.

Very large bronchoceles sometimes obstruct respiration, deglutition, and the return of the blood from the head, in so serious a degree, that a surgeon would feel greatly inclined to make any rational attempt to relieve his patient, even though it might be one of a bold description. For the relief of these cases, the foregoing operations are entitled to impartial consideration, especially as they are founded upon correct principles, and have already been accomplished in several instances with success.

CHAP. XXX.

WOUNDS OF THE CHEST,

Are divided into superficial, and penetrating. The former do not materially differ from common wounds of the skin and muscles in other situations, and, therefore, do not require particular consideration.

It is frequently difficult to pronounce, whether a wound extends into the cavity of the thorax, or not. The course of many narrow stabs cannot be easily followed by a probe, because they have been received while the part was in a posture, which cannot be precisely ascertained, but in which alone their track admits of being traced with a probe, completely through the parietes of the chest. But, if the symptoms do not indicate any difference between a superficial wound of the chest, and one which just enters its cavity, no practical good can result from knowing to which description it answers, and a great deal of mischief may arise from painful examinations.

Sometimes, however, the passage of air into and out of the wound, leaves no doubt, that the injury extends beyond the pleura costalis. This symptom, which can only be expected when the wound is straight and freely pervious, arises from the alternate enlargement and contraction of the thorax in respiration. In the perfect state, the surface of the lungs is always in close contact with the pleura costalis, both in inspiration and expiration. The lungs themselves are only passive organs, quite incapable, by any action of their own, of expanding and contracting, so as to maintain their external surface in contact with the inside of the thorax, which is continually undergoing a change of dimensions. Every muscle, that is concerned in enlarging and diminishing the chest, must contribute to adapting the volume of the lungs to the size of this cavity, as long as there is no communication between it and the external air. In inspiration, the thorax is enlarged in every direction, the lungs expand, and the air, entering through the windpipe into their air-cells, prevents a vacuum. But when there is a free communication between the atmosphere and the inside of the chest, and this cavity expands, air must enter into the bag of the pleura, and the lung remain proportionally collapsed. There are several reasons why this event does not regularly take place in wounds of the chest: the principal one is, that the opening is rarely ample and pervious enough, and is soon covered with dressings; another is, the great frequency of adhesions between the pleura costalis and pleura pulmonalis.

When, however, air has entered the bag of the pleura, through the wound, a part of it is expelled by the next expiration, in which the capacity of the chest is diminished.

It is commonly believed, that if the two bags of the pleura communicated by an opening between them, or that if the lungs were included in only one bag, instead of two distinct ones, suffocation would be the usual consequence of penetrating wounds of the chest. Bertrandi asserts, that if a free opening be made into each side of an animal's chest, both lungs collapse. Yet, this statement does not altogether coincide with certain observations, which have been published. That, in emphysema, the lung does sometimes collapse, and air fill up the space, which that viscus previously occupied, is a truth, of which there is abundant proof.* But, in other instances of emphysema, upon an opening being made into the chest, no air was found in the bag of the pleura, the lung was seen in contact with the side of the chest, "nor did it recede when exposed."† It appears from Bremond's experiments, that not only when an opening is made into the cavity of the thorax, but even when some of the ribs are removed, the lungs still occupy their natural situation, and actually protrude at the opening during expiration.‡ It may also be concluded from other investigations, that the lungs frequently do not collapse, when the cavity of the chest is exposed in a living animal§; a fact, which Mr. Abernethy had also an opportunity of ascertaining in a case, where he divided the pleura costalis in an instance of supposed hydrothorax, in which no water was found.|| And in opposition to the assertion of Bertrandi, recoveries have followed wounds on both sides of the thorax, larger than the orifice of the glottis.¶ Herniæ of the lungs from wounds of the thorax, are additional proofs, that these organs do not invariably collapse even though the opening be large. The circumstances, however, which account for the collapse of the lungs in some cases, and not in others, are at present quite unexplained, except inasmuch as the event may be influenced by the presence of adhesions, and the size, and direct or indirect course of the wound. If a single unequivocal instance be found, in which a free and direct opening may be made in the thorax, without inducing a collapse of the lung, though no adhesions existed, (a fact now fully established,) is it not reasonable to suppose, that, unless other causes be concerned, a wound of precisely the same nature can never have such a consequence?

Emphysema is a diffusion of air in the cellular substance, and may occur in wounds which just enter the cavity of the chest; in others that extend more deeply, so as to wound the lungs; and in cases in which these organs are wounded by the spiculæ of a broken rib, or clavicle. I believe emphysema is never very extensive, when the air vesicles of the lungs are uninjured, and there is an outer wound, through which the air can freely escape. The worst cases are a more frequent complication of fractured ribs, and narrow stabs, than of large penetrating wounds.

When the chest expands, in inspiration, some of the air, which enters through the trachea into the wounded lung, instead of distending this organ, now passes through the breach in it, into the space between the pleura pulmonalis and pleura costalis. In the living body, the whole of the inspired air will not be thus effused;

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* See Abernethy's Surgical Works, vol. ii. p. 171. edit. 1811.

† Op. cit. p. 175.

‡ Mém de l'Acad. des Sciences, an. 1739.

§ Norris, in Mem. of the Med. Soc. of London, vol. iv. p. 440.

|| Surgical Works, vol. ii. p. 179.

¶ Hennen, in Obs. on Mil. Surgery, p. 405.

but as it must pass through the lung, it will at first distend it, more or less, according to the size of the opening in the pleura pulmonalis; and such partial dilatation of the wounded lung will always happen while air continues to be inspired on that side. *

When the thorax is next diminished in expiration, the effused air is compressed against the wounded lung; but none of it can enter this viscus again, because the whole of the air, contained in the lung, must be forced out, and what is effused makes equal pressure on every part of the organ, as this becomes collapsed, so that it cannot separate any particular part, and make a passage for itself towards the trachea.

In this manner, fresh air accumulates in the space between the pleuræ at every inspiration, while none can escape during expiration; and thus suffocation may, at last, be produced by the pressure of the collected air on the diaphragm, mediastinum, and opposite lung.

When emphysema happens to be a complication of narrow stabs, or of fractures of the ribs, attended with injury of the lungs, the pleura costalis and intercostal muscles are at the same time wounded or lacerated, so that part of the air also usually gets through the wounded membrane into the cellular substance on the outside of the chest, and thence is sometimes diffused, through the same substance, over the whole body, so as sometimes to inflate it in an extraordinary degree. The inflation of the cellular substance has been considered the most dangerous part of the disease; but Mr. Hewson † most ably proved, that this supposition was erroneous. The wound of the pleura and intercostal muscles may sometimes be too small to suffer the air to pass readily into the cellular membrane, and may confine a part of it in the cavity of the thorax, in which circumstance, it will compress the lungs, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation, which water does in hydrops pectoris, or matter in empyema.

The air, however, in general, makes a way for itself through the cellular membrane; and as the passage of air into the cavity of the thorax, through the breach in the lung, during inspiration, is more easy than the return of that which has been already effused into the cellular membrane, this effusion continues to go on with great rapidity, and is increased by every expiration.

The degree, in which the inflation of the cellular membrane sometimes happens, may be judged of by the case related by Littre: ‡ where the swelling on the chest was eleven inches thick; nine on the abdomen; and four on all other parts of the body, except the scalp, palms of the hands, and soles of the feet.

In cases of emphysema, the danger does not depend so much on

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* See Halliday's Obs. on Emphysema, 1807.

† Med. Obs. and Inquiries, vol. iii.

‡ Mém. de l'Acad. Royale des Sciences, pour 1713.

the extent of the external swelling, as on the degree of compression produced on the mediastinum, diaphragm, and the lung of the opposite side, combined with inflammation and extravasation in the chest.

If air should not diffuse itself before the third or fourth day from the accident, there is not much chance of its doing so afterwards, because the cellular membrane is soon closed with coägulating lymph.

In cases of emphysema, Mr. Abernethy recommends the application of a bandage round the chest, whether the lung be collapsed or not; and he considers the plan especially useful, when any of the ribs are broken.* There can be no doubt, that a bandage must tend both to prevent the increase of the emphysema, and the pain which the motion of the unsupported fractured ribs would otherwise cause. But the external crackling tumour has never seemed to me a serious occurrence of itself, and its extension can always be stopped by making a few punctures, or scarifications. Some cases, which have fallen under my observation, incline me to doubt, whether bandages are ever proper, as long as air is passing from a wound of the lung into the bag of the pleura. They hinder the egress of air from the chest through the breach in the pleura costalis, and by so doing, they must have the effect of augmenting the quantity of that air which is confined within the chest, and of producing a dangerous pressure on the mediastinum diaphragm, and opposite lung. If the bandage be employed with the view of indirectly stopping the continual passage of air out of the wound in the lung itself, and of expediting its healing, I do not know that the practice is really necessary; because, if the patient live a few days, the adhesive inflammation invariably shuts up the injured air-cells, and the further escape of air is then effectually prevented. These sentiments are offered, with diffidence, both because several points, relative to the state of the lungs in emphysema, have not hitherto been satisfactorily explained, and because the employment of bandages in these cases is sanctioned by high authorities.

When the emphysema is large, it is highly proper to give an outlet to the air, by making small punctures in various situations, and promoting its exit by frictions. Indeed, the surgeon is always to be content with this practice, unless the symptoms of compression on the diaphragm and opposite lung, and the approach of suffocation, denote that the air cannot get out of the cavity of the pleura so quickly as it finds its way into it; in which case, a small, but direct, opening is to be made into that side of the chest, on which the wound is situated.

The practice of endeavouring to exhaust the air from the chest with syringes, is now universally rejected, because the air is soon absorbed; and the use and possibility of making the collapsed lung expand in this sudden way, are not credited by the best practitioners.

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* Surgical Works, vol. ii. p. 183.

The objection to immediately closing a wound, practised to remove the pressure of the air off the diaphragm and opposite lung, is, that this pressure may possibly recur, in consequence of the air collecting again. Yet I am by no means certain, that the chance of a relapse is such as to justify the plan of keeping a short cannula in the wound, for about forty-eight hours. The most experienced surgeons, I believe, do not find this proceeding necessary. When the wounded lung collapses, and remains quietly in this state, its condition is the most favourable for the healing of the breach in it; and if a small direct opening has been practised, the air will rarely accumulate in such quantity again in the chest, as to make dangerous pressure on the diaphragm, mediastinum, and opposite lung; and this latter will be enabled to do its functions, so as to support life, till the wounded lung is healed.

The wound, however, never requires to be kept open longer than two days; because, at the end of this time, the wound in the lung is always closed with coagulating lymph, and no more air can escape.

Unfortunately, in these cases, the danger is frequently owing to other causes, besides the pressure of air on the lungs, diaphragm, &c.: the interlobular cellular substance of the lungs may become inflated, together with the rest of the common cellular membrane, and thus compress the air-cells in a degree that may produce suffocation. Emphysema, and the pressure of the confined air on the lungs, may be accompanied with a copious extravasation of blood in the chest. Lastly, besides these sources of danger, another considerable one is the tendency of the lungs and pleura to such inflammation, as will of itself destroy the patient, unless counteracted by active antiphlogistic treatment.

WOUNDS OF THE LUNGS, &C.

In wounds of the chest, it is often difficult to pronounce with certainty, whether they penetrate into the sac of the pleura; but all doubts, with regard to this point, are removed as soon as air is found to issue from the wound when the patient coughs. That the lungs are wounded may be inferred with nearly equal correctness in every case, in which a person coughs up blood immediately, or soon after being wounded in the chest.

It rarely happens, that a weapon enters the cavity of the thorax, without producing more or less injury of the lungs, and the danger of the latter accident is in proportion to its depth, its situation, and the size of the weapon. A wound of the lungs with a small sword, seldom gives rise to much effusion of blood in the chest, unless the large vessels, near the roots of those organs, happen to be hurt. Putting this circumstance out of present consideration, the usual symptoms, which the patient suffers, are a spitting of blood, cough, and difficulty of breathing, succeeded by a good deal of symptomatic fever. "To discover whether the wound has injured the lungs, or not, (says a modern writer,) is a point, which has given to the older surgeons great room for the employment of their ingenuity in devising possible cases, and has occasioned no small waste of time and wax-tapers in ascertaining the exit of air through the passage. A practical surgeon will require but little investigation: bloody expectoration *immediately* on receiving the wound, and the terrible symptoms of dyspnœa, sense of stricture and suffocation, insupportable anxiety and faintness, which succeed, soon enough discover the fact." The immediate danger is either from the quantity of blood withdrawn from the circulation by inward hemorrhage, or from the passage of the blood into the air cells and cavity of the thorax, so as to cause suffocation. Emphysema may also cause more or less suffering and danger. The symptoms here enumerated, whether single or in combination, may be deemed the primary effects of wounds of the lungs. Violent inflammatory affections of these organs and of the pleura, subject to relapse; long and tedious suppurations, and exfoliations of bones are the secondary; and, though not so rapidly fatal, are often as certainly so as the others. Diseases also may follow, which, although we cannot strictly call them pulmonary consumption, agree with it in many points, particularly in cough, emaciation, debility, and hectic.*

When the weapon is broad, and it has entered the substance of the lung, the hemorrhage is considerable; blood is immediately extravasated in the cavity of the thorax, and also flows out of the external wound; the patient has a violent paroxysm of coughing, in which some of the blood is ejected from the mouth; the air comes out of the chest with a hissing noise; and, if the outer wound be not parallel to that of the lungs, emphysema takes place. As I have already stated, the danger of such an injury depends upon the depth of the wound, and the size of the vessels which are opened. Some patients recover; while others die instantly, or in a very short space of time.

As an interesting author remarks, it is a thing really wonderful, "that the thorax, containing the heart, lungs, and great vessels, should be so often wounded with so little danger. Many, no doubt, die; but numbers escape; for a wound of the substance of the lungs is far from being mortal. The blood may suffocate the patient; the fever and pain may waste him; he may die of the inflammation, or of the oppression of the lungs; or there may be time for a large suppuration, or a lingering hectic to cut him off; but still if his wound be only in the edge of the lungs, he is in some degree safe. He is only in danger when the thick substance of the lungs is perforated, and falls into abscess; or when the root of the lungs is wounded; for, there, the large vessels of the lungs being opened, the great effusion of blood, like that from a wound of the heart itself, must kill, even by the quantity of blood lost to the general system. But besides, this blood being thrown into the trachea, deluges the lungs, the patient spits up a frothy blood; and blood, instead of air, occupies the bronchiæ; so that he struggles for breath but a few moments, and then expires." *

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* See Hennen's Obs. on Mil. Surgery, p.395.

From the previous observations it appears, that the patient may die instantaneously of internal hemorrhage, or may be cut off by the effects of inflammation within the cavity of the thorax, or by the impediment to respiration occasioned by air confined in the same cavity. If (says Mr. John Bell) the patient be spitting blood, and the breathing be high, but not much oppressed, or the oppression increase but slowly, there are hopes that he may be saved. If there be no great vessel wounded in the lungs, so as to suffocate him at once, it is probable, that the smaller vessels which are opened will gradually cease to bleed; and, after four or five days of alarming cough, with blood expectoration, this symptom will cease; and, in order that the patient may be the sooner extricated from this danger, *he must be very freely bled. Let it be the intention to reduce him very low by quick bleedings; and let these bleedings have the effect of continued internal hemorrhage, without the dangers of it.* Let them depress him to the same low condition to which the inward bleeding would most likely have brought him; and the system being emptied in this direction, there will be less danger of immediate suffocation in the lungs, and but little fear of the succeeding inflammation of those organs attaining a fatal degree. *If the surgeon bleed only when the cough and bleeding from the lungs return, he can never do wrong.*

In all cases of penetrating wounds of the chest, and especially in injuries of the lungs, the free use of the lancet is the only thing which can be depended upon in the early part of the treatment. By it, internal hemorrhage is restrained; and by it, the dangers of the subsequent inflammation of the thoracic viscera are to be averted. The records of surgery furnish abundant proof of the necessity of such practice. The extent, indeed, to which the bleeding must sometimes be carried, is truly surprising. Le Dran bled one man fifteen times, whom he cured of a wound of the lungs; and in a similar case, Schmucker bled a patient four times a day for eight days in succession. † And in another instance, where a musket ball had entered the left shoulder, passed through the lungs, and come out below the left nipple, and where a profuse arterial hemorrhage took place from the mouth, threatening immediate suffocation, the bleeding was checked by repeated venesections, which were so freely practised, that two hundred and fifty ounces of blood were drawn off by the lancet in eighteen days. ‡ In every penetrating wound of the chest, and more particularly when the lungs are injured, the first bleeding should be copious. If the patient should faint, we ought not to administer cordials, but allow him to revive gradually. We should avail ourselves of this opportunity to extract, without pain, all foreign bodies within reach, whether cloth, ball, iron, wood, or splinters of bone. Should there be reason for believing, that extraneous substances are lodged, and that by an enlargement of the wound, they might be extracted, the practice ought to be immediately adopted. The next object is to dress the wound. If it be a gunshot-wound, a light mild dressing will be sufficient; but if an incised one, the lips of it should be closed at once. The patient is now to be left to repose, and he will often lie for some hours in a state of comparative ease, till the vessels again pour forth their contents, induce fresh spitting of bloody froth, and a repetition of all the symptoms of approaching suffocation. In this circumstance, the lancet must be used again without hesitation. When the paroxysms of pain, the sense of suffocation and hemorrhage have abated, or recur at longer intervals, if the cough be very severe, we may try digitalis, with opiates. The lowest diet is to be prescribed. Mild saline purges and an emollient enema are to be occasionally administered, if required, and the patient kept cool, and away from every thing which is likely to disturb him. Should we be fortunate enough to preserve our patient during the first six or seven days, a relaxation from this rigour may be cautiously admitted; but, as Dr. Hennen observes, a departure from the general plan, or an omission of bleeding on the rising of the symptoms, can only tend to accelerate the event that our efforts are designed to counteract. * When much cough and pain in the breast continue after bleeding has been fully practised, the application of blisters to the chest is a plan of the highest utility. Frequently leeches, or cupping, will also still be necessary. In some examples, the inflammation terminates in suppuration within the lungs, or sac of the pleura, the symptoms and treatment of which cases belong to the subject of empyema.

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* Discourses on the Nature and Cure of Wounds, p. 257. edit. 3.

† Richter's Ansfangsgr. der Wundarzn. b. iv. p. 327.

‡ Thomson's Reports of Observations made in the Military Hospitals in Belgium, p. 86.

One circumstance sometimes deceives the surgeon, and makes him suppose the case to be a penetrating wound of the chest, when it is not so: a musket-ball occasionally pierces the skin and muscles on the outside of the chest, runs round the ribs, and makes its exit nearly opposite the point of entrance. Here the absence of bloody expectoration, and of other symptoms of injured lungs, together with the direction of the track of the ball, will convey useful information.

There is also another source of deception, as to the actual penetration of balls into the cavities of the body: this is when they strike against a handkerchief, linen, cloth, &c. a fold of which is carried by them into the wound, and, when incautiously withdrawn, the bullet is not perceived. Larrey, Hennen, and other writers, relate several instances of this nature.

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* Obs. on Mil. Surgery, p. 400.

Wounds of the chest are sometimes complicated with the lodgment of extraneous substances in that cavity, and this sometimes without occasioning fatal consequences, either immediately, or subsequently. Thus, Dr. Hennen, in examining the bodies of soldiers who had died of such injuries, frequently found pieces of wadding, of clothes, spiculæ of bone, and balls, and in one case, some charpie, used as a dressing, either loose in various parts of the lungs, or lying in sacs, formed by a deposition of coagulating lymph. In some more fortunate patients who recovered, the extraneous substances were discharged, or extracted from the wound; while in other lucky examples, they were ejected by the convulsive efforts to cough, which their irritation had excited.* The same author relates the following case to prove, that a much larger mass, than a bullet, may pass even through the lungs, without doing away all chance of recovery. A soldier was wounded through the thorax, between the third and fourth ribs of the right side. The wound was large enough to admit three fingers conically placed; and blood and air were freely discharged from it. On turning the man at the time of changing the dressings, a tumour was discovered on the scapula, from which was extracted his breast-plate, about two-thirds of which were rolled up by the force of the blow into a figure somewhat resembling a candle-extinguisher, with the musket-bullet contained within it. The other third was broken off; but it also had passed through the wound, and was extracted. The man survived the injury three weeks, and at one period afforded great hopes of recovery. The circumstance, however, of nothing particular happening in this case for the first five days, must raise doubts, whether the breast-plate and bullet actually went through the lungs; a conclusion, which should hardly have been made without an examination of the state of those viscera after death.

There is less difficulty, however, in understanding how a bullet may lodge many years in the substance of the lungs, without producing inconvenience enough to indicate even its situation. We know, that, after the first dangers of such injuries are over, the balls are included in a kind of cyst, formed round them by the adhesive inflammation, and may occasion little or no disturbance in the functions, or sensations of the part. Some curious instances are also recorded, in which loose balls have rolled about in the cavity of the thorax at every motion of the patient. †

When a penetrating wound of the chest is of a certain size, a protrusion or hernia of the lung may happen. If the exposed part of the lung should not be in a bleeding state, the most rational practice must be that of returning it, as speedily as possible, into the cavity of the chest again; and if necessary, even to enlarge the wound for the accomplishment of this object. Several cases are recorded, however, in which the projecting piece of lung was either removed with a knife, or ligature, and the patients recovered.* The projecting portion of the lung often has a livid appearance, occasioned by exposure of the part to the air, and its strangulation between the ribs. But, this affords no proof, either that the protruded part is gangrenous, or that it ought to be removed.† Loyseau, when he had cut off a piece of lung, which he supposed gangrenous from its appearance, put it in water, and was surprised to find it immediately resume its natural colour. Even were the part really in a mortified state, the safer practice must undoubtedly be that of allowing a natural separation of the slough to take place.

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* Op. cit. p. 590.

† See Percy's Manuel du Chirurgien d'Armé, p. 95.; Magatus's Bibliotheca Chirurgica; Hennen's Mil. Surgery, &c.

EXTRAVASATION OF BLOOD IN THE THORAX.

The diagnosis of this case is by no means free from obscurity. The following, however, is said to be the ordinary character of the symptoms. In most instances, a wound of the lungs being the source of the hemorrhage, this occurrence will be indicated by the issue of frothy blood and air from the external wound, and by the patient's coughing up blood in large quantities. If, however, the bleeding be from an intercostal artery, the internal mammary, or other sources, no blood will be coughed up. Directly after the receipt of the injury, the patient generally falls into a state of syncope; and though the bleeding may not be very considerable, he is affected with cold sweats, and his pulse is feeble and small. Notwithstanding copious and repeated venesections, practised after his revival, respiration becomes short, difficult, and laborious; and inspiration is said to be more easily performed, than expiration. The patient usually lies upon the side on which the extravasation is situated; and this side seems rather larger and broader, at its lower part, than the opposite corresponding part of the chest, on which the patient cannot lie, without an aggravation of all his sufferings. When he tries to sit up in bed, he cannot remain in this position, unless he bend his body very much forwards, in order to facilitate respiration. He feels a sense of great heaviness about the ensiform cartilage, and diaphragm, attended with a frequent cough, and a most oppressive sensation of suffocation. According to Valentin, sometimes in an advanced stage of the case, a large ecchymosis, or violet-coloured spot, makes its appearance about the angles of the ribs; but this symptom is far from being either constant or restricted to the cases before us; nor did it occur in the instance of extravasation of blood in the thorax, recorded by Dr. Thomson.‡ In general, blood escapes from the external wound, unless the opening be very small, or situated in the upper part of the chest. Lastly, it is remarked, that the oppression of breathing from inflammation of the lungs usually subsides, or is lessened by venesection, which is not the case, when it depends upon extravasation.

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* Fabricius Hildanus Centur. 2. Obs. 32. p.108.; Loyseau Obs. Medicinales et Chirurg. p.25.; Ruysch, Obs. Anat. Chir. Obs. 53. In a soldier, wounded at Waterloo, the great length of a piece of protruded lung, and the manner in which it was lacerated and injured, induced me to follow this method; but the patient did not ultimately recover.

† Lassus, Pathologie Chir. t. ii. p. 309.

‡ Reports of Observations made in the Military Hospitals in Belgium, p. 85.

If it be true, that in some patients the breathing has been very little oppressed, notwithstanding an extravasation of blood in one of the cavities of the pleura, and that others have been able to lie with equal ease, either upon the sound or diseased side*, which is not common, we must conclude from these anomalous cases, that we ought not to form our opinion from any one symptom in particular, but from the assemblage of a great many.†

An extravasation of a large quantity of blood in the chest is unquestionably an urgent case, both because the patient is in danger of immediately dying of the inward hemorrhage, and because he is afflicted with alarming symptoms of suffocation. These latter, it is true, call for paracentesis thoracis, in order that the effused blood may be discharged, and its pressure be removed from the lungs; yet this very proceeding is itself hazardous, as it may renew the internal bleeding, of which the patient may at once perish. Thus the surgeon has before him two dangers, equally great; viz. that of seeing his patient die of suffocation, if the operation be not performed; and that of beholding him fall a victim to hemorrhage, if an opening be made for the evacuation of the blood before the wound in the vessel is closed.

I believe, that, in this difficult part of surgery, they are generally the most prudent practitioners who are not too officious, and hasty in taking measures for discharging the blood. Scarpa, Larrey, Assalini, and Hennen, all agree that wounds of the chest should be closed, and lightly and superficially dressed. Scarpa‡ in particular insists upon the prudence of omitting no means for effecting the immediate union of a penetrating wound, care being taken to check the force of the circulation by repeated bleedings, and every antiphlogistic remedy, in order to prevent or diminish internal hemorrhage as much as possible. If, says he, notwithstanding such treatment, blood should be extravasated between the pleura and lungs, it would press equally upon every point of those viscera, and contribute to stop the bleeding. When the wound in the lungs is healed, and the extravasated blood is not in too large a quantity, it will be gradually removed by the absorbents. In the contrary case, it will form a swelling beneath the cicatrix, and present itself externally§; or, then, if necessary, a counter-opening may be made.

If, after a time, the presence of the blood should be followed by suppuration in the cavity of the thorax, the urgency of the symptoms, arising from this new state of the case, must then determine the propriety of the operation. The danger of renewing the bleeding is now past, and no longer a consideration in the mode of treatment.

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* See a Case by Thomson, op. cit. p. 87.

† Lassus, Pathologie Chir. t. ii. p. 319.

‡ Sull' Ernie Memorie Anat. Chir. Mem. 4.

§ Petit sur les Maladies observées à l'Hôtel Dieu de Lyon, p 299.

When the propriety of discharging a collection of blood in the chest has been determined upon, several modes of fulfilling this indication have been suggested. 1. Placing the patient in a posture favourable to the escape of blood from the wound. 2. Drawing out the blood with a syringe or tube. 3. Enlarging the wound. 4. Making an opening at a depending part of the chest.

1. It is only when the wound is large, and direct in its course, and the blood in a fluid state, that mere posture will answer.

2. Syringes, or tubes, are likely to do more harm by their irritation, than good by facilitating the discharge of the blood: when this is fluid, it will escape spontaneously, if the opening be depending; and when coagulated, it cannot be drawn out with such instruments.

3. The enlargement of the wound will only be useful, when its situation is favourable for the escape of the blood.

4. When the blood is coagulated, the injection of tepid water is sometimes recommended, especially by French surgeons, who direct the practice to be repeated every day, till the fluid returns untinged with red globules, and quite free from coagula. On the utility of this proceeding, I can offer no decided opinion, because I have never seen any case, which seemed to require it; but I have no hesitation in expressing a strong suspicion, that whatever may be the propriety of throwing fluid into the chest, there never can be any good sense or reason in keeping the external wound open for the performance of the experiment.

5. When the wound is narrow, and situated either at a fleshy part of the chest, or at its upper part, a counter opening should be made in a depending situation, and in the manner described in the next chapter.

CHAP. XXXI.

PARACENTESIS OF THE CHEST.

This operation consists in making an opening into the cavity of the chest, for the purpose of giving vent to air, water, matter, or blood, by the pressure of which the functions of the lungs are dangerously obstructed.

The surgeon can hardly ever know with certainty, that a fluid is contained in the chest, so equivocal are the ordinary symptoms. If there were not this cogent reason, still the idea of performing the present operation with such an instrument as a trocar, is deserving of the strongest reprobation. The proper instrument is a small bistoury; and the operation, when cautiously and skilfully executed, is not likely in itself to prove dangerous. Hence, though in most of the cases, in which we are called upon to perform paracentesis, there may generally be considerable doubt about the presence of a fluid in the chest, yet, if symptoms are urgent, we should not be afraid of practising a small opening, as the very failure will be itself a source of useful intelligence.

When the cavity of the chest is filled with water, the disease is termed *hydrops pectoris;* when with pus, *empyema*, a word implying internal suppuration. Both water and pus, extravasated in the chest, have some symptoms common to them; such as short and difficult respiration, the lungs of the affected side being compressed by the collection of surrounding fluid. In both cases, also, expiration is even more difficult than inspiration, on account of the weight of the fluid, which strongly opposes the elevation of the diaphragm. Sometimes, when the patient moves in bed, he distinctly feels the undulation. If the fluid be contained in only one cavity of the chest, he cannot lie comfortably on the opposite side, because the fluid compresses the other lung. The ribs on the affected side are more arched than is natural, because the fluid resists their depression. When no symptoms of suppuration have occurred, the case may be deemed hydrops pectoris. The face, the integuments of the chest, and lower extremities, are frequently œdematous, and sometimes also the arm on the side affected, especially when the quantity of fluid is copious. Sometimes dropsy of the chest is joined with the same general affection of the whole body. All these symptoms, however, may indicate empyema, when combined with preceding marks of inflammation and suppuration in the chest. When symptoms of acute peripneumony have taken place; and when rigors have occurred at the termination of the inflammatory fever, just before the commencement of the above kind of symptoms; it is rational to infer, that the case is empyema. I remember a man in St. Bartholomew's hospital, whose heart was pushed to the right side of the chest, by an abscess in the left bag of the pleura. The preceding inflammation in the chest, the occurrence of rigors, the great difficulty of breathing, and the palpitation of the heart, quite on the right side of the sternum, made the nature of the case sufficiently evident. When the left cavity of the chest was opened after death, an enormous collection of matter was discovered. In this instance, paracentesis ought undoubtedly to have been performed.

With regard to the most proper place for the opening, a few words are necessary, because some excellent surgeons, among whom is Bertrandi*, disregarding every other consideration, but that of making a depending aperture, advise us to perform the operation between the third and fourth false ribs, counting from the last, and about four or five finger-breadths from the spine. But every object can be effectually obtained by making an opening more forward, where there are no muscles, except the intercostals, to be divided. The most eligible place, is between the sixth and seventh true ribs, just at that point, where the indigitations of the serratus major anticus terminate. By placing the patient on his abdomen, this opening may be rendered very depending.

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* Traité des Opérations de Chirurgie, p. 253, 254. edit. 1784.

An incision, about two inches long, must be made through the integuments, which are first to be drawn to one side, if it be intended to close the wound immediately after the operation. The intercostal muscles are next to be cautiously divided, and as soon as the pleura costalis is exposed, a small puncture carefully made in it. The intercostal muscles must be divided closely to the upper edge of the lower rib, in order to avoid all risk of wounding the intercostal artery, which runs in a groove along the lower edge of the upper rib.

In emphysema, a small puncture will suffice; in hydrops pectoris, it may be somewhat larger; and, in empyema, the matter must have an opening of sufficient size to allow the fluid to escape freely, and a short cannula to be introduced.*

The only circumstance, in which the opening should be made elsewhere, is when the fluid happens to be prominent at some other point of the chest.

CHAP. XXXII.

REMOVAL OF A DISEASED BREAST, AND TUMOURS IN GENERAL.

The manner of removing encysted tumours has been already described.

When the breast is affected with any disease of an incurable nature, the whole of the diseased parts may sometimes be removed with a knife, the wound healed, and the patient's life prolonged, or freed from great suffering and annoyance. The circumstances, under which the operation should be undertaken, are noticed in the chapter on cancer.

If the disease be of a scirrhous or malignant nature, some particularity in the mode of operating is requisite. In this case, the surgeon, instead of merely removing parts which are palpably and visibly diseased, should make it a rule to take away a certain quantity of the substance in the immediate circumference of the disease. Every experienced man is fully aware of the great propensity of the skin to be affected, and the frequent extension of white morbid bands into the surrounding adipose membrane. These facts clearly show the propriety of making a free removal of the skin, whenever it is in the least discoloured, puckered, adherent to the swelling, or in any way altered, and of taking away a good deal of the fat, in which scirrhous tumours are sometimes involved. On the contrary, if the disease be a mere sarcomatous enlargement, the removal of the skin is not necessary on this principle, though it may be so on another, viz. the superfluous quantity of it, when the tumour is very large. When cancer recurs, the skin is the first part in which it usually makes its appearance, and the skin of the nipple in particular. Hence, many surgeons always make it a rule to remove the latter part, when it is judged proper to take away any of the integuments. As Sir Astley Cooper has observed, it is not sufficient to remove the tumour, but the gland, from the nipple to the tumour, must be removed, and the surrounding parts, to some extent, taken away.*

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* See Hey's Practical Obs. in Surgery, p. 497. edit. 2.

The patient is usually operated upon in the sitting posture; but, the recumbent has advantages, particularly when any gland in the axilla is to be taken away, or, the patient is likely to faint. If the sitting posture be chosen, the pectoral muscle is frequently made tense by keeping the arm back with a strong stick, placed transversely behind the back, in front of the arm; but, as this method is rather alarming to females, it is better to let an assistant take hold of the arm above the elbow, raise it from the side, and incline it backward, so as to put the great pectoral muscle on the stretch.

When the case is not of a malignant character, and no part of the integuments is to be removed, a straight incision may be made through them; the tumour is to be regularly dissected on every side from the circumjacent parts; and lastly, its base is to be detached, from above downward, till the whole is separated.

If the outer incision has been made transversely, the lower half of the swelling should be separated from its surrounding connexions, before the dissection of the upper portion is begun, by which means, the surgeon will not be incommoded by the blood falling into the lower part of the wound, before the detachment of the adjacent portion of the tumour is effected. As soon as the lower half of the swelling is separated from its connexions, the surgeon is to undertake the dissection of the upper half.

Such are the modes of removing all simple tumours, which are not of a malignant nature, nor of immense size.

When the tumour is malignant, and adherent to the skin and pectoral muscle, the operator is to remove, at least, an inch or two of the fat on every side of the disease. The portion of the skin, intended to be taken away, must be included in two semicircular incisions; which meet thus () at their extremities; and when the base of the tumour is to be detached, the surface of the pectoral muscle, wherever it is adherent to the tumour, is also to be removed. The advantage of making the incision, in the preceding manner, obviously consists in enabling the surgeon to bring the edges of the wound together after the operation, so as to form a straight line, and admit of union by the first intention.

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* Lectures, vol. ii. p. 199.

The mere magnitude of a tumour frequently renders it highly judicious to take away a portion of the skin: if some were not removed, the dissection would be tedious; and, after the operation, the loose skin would lie in folds, and form, as it were, a large pouch for the lodgment of matter.

In the extirpation of a diseased breast, the direction of the external incision must, in some measure, be determined by the shape of the tumour; but, according to Desault, there are advantages in cutting as much as possible transversely, when circumstances will allow. It is alleged, that, as the integuments are more yielding upwards or downwards, than they are in a cross direction, especially near the sternum, the transverse wound may be more expeditiously united; and that, as the great pectoral muscle only acts perpendicularly, with respect to the edges of the incision, it cannot tend to separate them. Desault thought these advantages of higher importance, than that of the easy escape of the matter at the depending angle of the wound; the reason generally assigned for the perpendicular direction of the incision, commonly preferred. In this country, the direction of the wound is often made obliquely downwards and forwards, and the base of the tumour cut from the pectoral muscle in a similar direction, the detachment being first accomplished at the upper and outer part of the wound, and then regularly extended to its lower and anterior end.

The tumour being removed, the surgeon should examine the interior of the wound, in order to ascertain, that no indurated part is left behind; and if any hardness be detected, it ought to be removed. He should also examine the surface of every scirrhous tumour, immediately it is taken out, and see whether any of the white bands, shooting into the surrounding fat, have been divided; for, in this case, some portions of those bands must have been left behind, and ought to be taken away. Their situation may be known, by considering the position of the tumour before the operation.

When the dissection will occupy a considerable time, every large artery should be tied as soon as it is divided. This remark is not meant to comprehend vessels of such a diameter, that, though they bleed when first cut, they do not long continue to do so, and therefore require no ligature.

When a tumour of the breast has been entirely detached, and the large bleeding vessels tied, the arm is to be brought forward. Then, if there be any diseased gland in the axilla, the patient should lie down on the opposite side, and the arm be raised, so that the armpit may be completely exposed to the light. The first wound should then be enlarged in the direction leading to the gland, which is to be taken hold of with a double tenaculum as soon as the skin over it has been divided, and being well raised up, it is to be cut away, together with the cellular membrane in the line between it and the diseased breast.* I have seen some distinguished operators content themselves with lifting up the diseased gland on a tenaculum, separate it from its lateral connexions, and then tie its base with a ligature. This method was preferred to its complete excisions, on account of the frequent difficulty in securing the short artery, which enters the gland, almost immediately it has quitted one of the thoracic arteries.

The operation being finished, the skin of the breast is to be relaxed, and the edges of the wound brought together with adhesive plaster, supported with a compress and bandage. I have never seen any real occasion for a suture, which is sometimes employed. The arm, on the same side, should always be kept quiet in a sling, until the wound is healed.

CHAP. XXXIII.

WOUNDS OF THE BELLY,

Are divided into two principal classes: in one, the solution of continuity is confined to the integuments, muscles, &c. exterior to the peritoneum: in the other, this membrane is penetrated, and frequently some of the viscera. Wounds, which do not extend through the peritoneum, are not materially different from those of ordinary textures, and are to be treated on principles applicable to wounds in general. However, if the injury penetrate more deeply than the integuments, the parietes of the abdomen generally remain weakened at the part, and, firm as the cicatrix may appear, if it be not supported with a bandage, it is liable to become the seat of a hernial protusion.† Severe contusions of the skin and muscles of the belly, are also sometimes followed by such an incapacity of resistance in them, that they yield to the pressure of the contained parts, and a particular kind of hernial tumour is the consequence.

A spent ball, striking the belly, may rupture the rectus muscle and aponeuroses of the abdominal muscles, so as to produce at once a protrusion of the viscera, while the integuments, on account of their greater elasticity, continue unbroken.* In other examples, the ball, in its rotation over the circumference of the abdomen, not coming against any hard projecting part, evenly depresses the parietes of the belly, and produces deeper mischief amongst the viscera, succeeded by inflammation, a copious effusion of bloody serum, in the cavity of the peritoneum, and other fatal effects.† In a case that had a favourable issue, a cannon ball carried away the integuments, a piece of the left os ilium, and the attachments of the broad muscles of the belly, exposing a part of the sigmoid flexure of the colon.‡

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* See Sir A. Cooper's Lectures, vol. ii. p. 200.

† See Richerand's Nosographie Chirurgicale, tom. iii. p. 322. edit. 2. Schmucker relates a case, which followed puncturing an abscess of the abdomen with a lancet, Vermischte Chirurgische Schriften, band. i. p. 197. See also a case by Wardrop, in A. Cooper's work on Crural and Umbilical Hernia, p. 60.

Sometimes, in consequence of punctured wounds, or violent blows, matter forms in the tendinous sheath of the rectus muscle, and when the abscess bursts, or is opened, several pints of pus are unexpectedly discharged. The nature of this case should be remembered, as there is frequently no change of appearance in the integuments, denoting either the suppuration, or its extent. Such an abscess ought always to be opened early, and in a depending situation. The same practice is advisable, when purulent matter collects between the layers of abdominal muscles, or between these muscles and the peritoneum.

Except when a wound of the belly is large and direct, attended with protrusion of the bowels, or the escape of feces, chyle, fetid air, bile, &c. the fact of its having penetrated the cavity of the abdomen is generally somewhat obscure. Authors do, indeed, advise us to compare the direction of the stab with the ordinary thickness of the abdominal parietes at the wounded part, and the breadth of the wound with that of the weapon, with which the injury has been inflicted. When the instrument has entered perpendicularly at a place where the parietes are thin, and when, notwithstanding the narrowness of the end of the weapon, the division is rather broad, it is inferred that the wound is of the penetrating kind. This mode of judging, however, must generally be fallacious, on account of the frequent impossibility of learning the exact direction of the thrust, or of obtaining a sight of the instrument. Also when a probe will pass perpendicularly into the wound for a certain distance, it is concluded, that the injury extends into the abdominal cavity. But it must not be positively inferred, that the wound does not penetrate because a probe cannot be thus introduced; for its passage may be stopped by the several layers of muscles, not having exactly the same situation with respect to each other, which they had at the moment of the injury. In short, unless the wound be straight, a probe can hardly be made to follow its course. I shall not dwell on the ridiculous suggestion to employ an injection, as a means of ascertaining whether the wound extends into the abdomen. Were the track of the injury rendered impervious by coagulated blood, an alteration in the relative position of the muscular layers, or other causes, the fluid could not pass into that cavity, even though the wound penetrated. There would also be a great chance of deception; for the liquid might be thrown into the cellular membrane, and seem as if it had entered the belly, when not a drop had passed in that direction. But were the inefficiency of this plan not enough to insure its rejection, its impropriety would prohibit its adoption by every practitioner of common sense. The local symptoms, then, of a simple penetrating wound are not to be depended upon, and the employment of probes and injections for ascertaining the point, is more likely to do serious harm than real good. Nor can certain information always be deduced from a consideration of what may be called the *general* symptoms; a small, feeble, contracted pulse; pallid countenance; cold extremities; great and sudden debility; hiccough; vomiting; and spasms. Several of these effects frequently take place in irritable, timid, nervous subjects, without any parts being injured, in addition to the skin and muscles; and they are frequently absent, when the weapon has actually entered the peritoneum. I am far from meaning to say, however, that such indisposition is to be disregarded; on the contrary, I would have the young surgeon pay particular attention to the symptoms in question, because if they do not soon subside, there are then strong grounds for suspecting something more, than the effects of a common superficial wound on an irritable, timid subject. But, in the beginning, unless the wound be large, or a protrusion of the viscera, or a discharge of bile, chyle, or feces, take place, there is generally a degree of uncertainty, with respect to the depth of the injury. At the same time, it is not to be concluded, that the wound does not penetrate, because no protrusion, nor extravasation happens; for a narrow stab may extend into the abdomen, even amongst the viscera, without giving rise to either of these accidents.

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* Larrey, Mem. de Chir. Mil. t. iii. p. 332.

† Op. et vol. cit. p. 334. See in Hennen's Mil. Surgery, p. 452., a case, in which nearly all the anterior parietes of the belly were torn away, leaving the lacerated peritoneum exposed. The injury was not immediately fatal.

‡ P. 340.

There is in these cases a class of symptoms, which Richter* and other writers denominate *particular*, from their evincing what bowels are wounded; as, for instance, bloody urine, when the kidneys and urinary bladder are injured; vomiting of blood, when the stomach is pierced; discharge of blood with the feces, when the large intestines are wounded. Symptoms, like these, must of course throw considerable light on the nature of the accident.

With regard to our not being always able to pronounce, whether a wound penetrates the cavity of the belly or not, the want of precise information on this point is of little practical importance; for, if the case be not complicated with any urgent symptoms, the treatment should obviously resemble that of a simple wound.

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* Anfangsgr. der Wundarzn. b. v. p. 7.

Penetrating wounds of the chest give rise to a variety of dangers; sometimes depending upon effusion of blood into the bronchiæ and air-cells of the lungs, or into the cavity of the pleura; sometimes upon the consequences of that extraordinary complication emphysema; but, more especially, upon the great tendency of the pleura and lungs to inflammation. The principal dangers of penetrating wounds of the belly also partly arise from internal hemorrhage, or extravasation of the contents of the viscera; but, in a still greater degree, from the strong disposition of the peritoneum to inflammation. With the exception of persons who die instantly, or in a few hours from internal bleeding, &c. nine tenths of those, who die from penetrating wounds of the belly, are cut off by peritonitis. They who perish with extravasation of the contents of the bowels, also die in fact from peritonitis, which is generally excited partly by the injury, and partly by the irritation of the effused matter. Many authors represent the danger of a penetrating wound of the belly, as principally arising from the entrance of air into the cavity of the peritoneum. But, according to my ideas, it is the wound itself, which excites the peritonitis, by which the patient is destroyed, and the same fatal inflammation would probably come on with equal frequency, were the wound entirely excluded from the air. The cavity of the belly is always so completely occupied by the viscera, that the whole inner surface of the peritoneum is constantly in close contact with them, and, therefore, the air cannot so easily enter within that membrane, as some writers seem disposed to believe.

WOUNDS IN WHICH THE VISCERA PROTRUDE, BUT ARE UNINJURED.

When a portion of intestine, or omentum protrudes, the sooner it is returned, the more effectually will the irritation, arising from its exposure and constriction, be prevented. Fomenting the protruded bowels, as is sometimes recommended, would be absurd; for what application can be so congenial to them, as the natural warmth and moisture of that cavity, into which they ought to be immediately reduced? And is it possible to suppose, that the efficacy of any artificial fomentation will make amends for the harm, resulting from continuance of the bowels in a state of exposure and constriction? In order to promote the reduction, the muscles of the abdomen should be relaxed; but, whether we ought to waste any time in giving clysters to empty the large intestines, previously to attempting to return the parts, is a question, on which I entertain nearly the same sentiments as those delivered on the subject of fomentations. The mesentery is always to be returned before the intestine; and the intestine before the omentum; but the last protruded portion of each of these parts ought to be the first reduced. In the reduction, care must be taken, that the bowels are completely returned into the abdomen, and are not pressed between the layers of the abdominal muscles, or into the sheath of the rectus muscle.

When the distention of the protruded intestine with air or feces creates a difficulty of reduction, its contents may frequently be gradually pressed into that portion of the intestinal canal, which is within the abdomen, and the gut may then be returned. But, if this plan were attended with difficulty, I should prefer dilating the wound to much handling of the bowel.

When the protruded bowel is distended with air, Pare and others recommend making small punctures in it with a needle, so that the air may escape, and the intestine collapse. This proposal is justly rejected from modern surgery, both on the grounds of danger and inefficacy. The small apertures, made with a round needle, will not discharge the air; for they are closed by the mucous coat *, and the making of larger punctures, as suggested by Desault †, would be far more dangerous than dilating the wound.

When it is absolutely necessary to enlarge the wound, the dilatation should be made in a direction, which will not endanger the epigastric artery; and, if possible, parallel to the muscular fibres.

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the right practice. Even when the inflammation is severe, the reduction of the part without delay, and the employment of antiphlogistic means, will often prevent gangrene. The dull, brown, dark-red colour of the protruded intestine, may induce the practitioner to suppose, either that it is already gangrenous, or that gangrene is inevitable, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in the state of gangrene, and, therefore, its immediate reduction ought to be put in practice. The recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but the propriety of speedily replacing it in its natural situation is a thing most certain. In case it should mortify, after being reduced, all hopes of the preservation of life are not to be abandoned, as I shall again notice at a proper opportunity.

When the omentum protrudes, and is strangulated by the narrowness of the opening, it soon contracts adhesions. Richerand has recommended us to cut off all this membrane, which exceeds the level of the integuments, and not to trouble ourselves about the remainder, which, he asserts, will act like a stopper, and hinder a future hernia. However, notwithstanding such advice, if the wound were quite recent, so that adhesions had not yet formed, the propriety of dilating the opening, and reducing the omentum, would be unquestionable. Many objections, founded on the danger of leaving

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* See Travers on Injuries of Intestines, &c. p. 176.

† Traité des Maladies Chirurg. tom. ii. p. 135.

this part in a state of constriction, might be made to Richerand's proposal; but, in the present state of surgery in this country, it cannot be necessary to enter into them. Whenever the omentum is also sound and free from constriction, it should be reduced. In cases where this membrane, besides protruding, is in a gangrenous state, surgical writers authorise the excision of the dead part, and the reduction of the rest, each of the bleeding vessels having been first tied with a small silk ligature. I apprehend, however, that whenever the omentum has been out so long as to slough, adhesions within the wound must generally have had time to form; an event which would embarrass the operator, and even prohibit the attempt. The reduction having been effected, the patient is to be laid upon his back, with the thighs bent upon the pelvis, and he must strictly avoid making any exertion, lest he bring on another protrusion. The wound is then to be closed with adhesive plaster, and the uniting bandage; but if the division be extensive, and these means ineffectual, it may be proper to have recourse to a suture. The stitches, however, should always be as few as possible. This method of sewing up wounds of the belly made a long subject, in all the old works on surgery, under the appellation of *gastroraphe*, which was nothing more than a quill-suture, practised by introducing the needle through both lips of the wound from within outwards, in order to avoid all risk of pricking the bowels. At the present day, we scarcely ever hear of gastroraphe being performed. In Pibrac's * dissertation on the abuse of sutures, cases are related which satisfactorily prove, that the majority of penetrating wounds of the belly may be healed very well without it; and if we wish for still more decisive proofs of the fact, we may find them in accounts of the Cæsarean operation, the extensive wound of which has frequently been healed by common means. But though sutures are not usually necessary for wounds of the belly, I will not assert, that they may not be useful under particular circumstances. For instance, were a large wound to be made across the abdomen, a suture might be indispensable to prevent the protrusion, or exposure of the bowels; yet, even in this case, the stitches should be as few as possible.

CASES, WITH INJURY AND PROTRUSION OF THE VISCERA.

Penetrating wounds of the abdomen, attended with protrusion of the intestines, or omentum, are always to be regarded as dangerous cases; but the danger is much more serious, when a portion of the intestine, not only protrudes, but is also wounded. Under such circumstances, we have the authority of numerous writers on surgery, as a sanction of the practice of sewing together the edges of the wound in the bowel; the true utility of which practice, however, is now a disputed point. Even the advocates of sutures here differ exceedingly, both as to the precise object in view, and the way of making the stitches. Some advise only one stitch to be made (frequently only through the mesentery); and they employ the ligature chiefly with the view of confining the injured bowel near the external wound, so that, in the event of any effusion, the matter may readily find its way outward. Other writers wish to remove the possibility of extravasation by applying numerous stitches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the external wound.

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* See Mém. de l'Acad. de Chir. tom. iii. 4to. Other cases of similar success may be perused in numerous works; Journal de Médecine, tom. lxxi.; Duncan's Medical Commentaries, vol. x.; Philosophical Transactions, vol. xlvi. &c.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be altogether needless. Supposing the breach in the intestine, however, to be somewhat larger, so as to be capable of letting the feces escape, what practice ought we to follow?—As Sir Astley Cooper was operating upon a strangulated hernia, an aperture, giving issue to the intestinal contents, was discovered in a portion of sound bowel, just when the part was about to be reduced. The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine. The part was then replaced, and the patient recovered. Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound; for the remnant always finds its way into the intestine, and is discharged by stool, without the slightest inconvenience. *

We are next to consider the case, in which the protruded bowel is still more extensively, or even totally divided. Here the admirers of the needle have found ample scope for their ingenuity; and since very few of them have met with cases exactly of this description in the human subject, they have made a variety of experiments on animals, in order to determine the right mode of treatment. Some of these reports are favourable to the practice of sewing up the wounded bowel. Ramdhor is stated to have actually cut off a large part of a mortified intestine in the human subject, and to have joined the sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture; the ligature being also employed to keep them near the external wound. The patient recovered, and the feces afterwards passed entirely the natural way.† About a year after the operation the patient died, when the anatomical preparation of the parts was sent to Heister. They were preserved in spirit of wine, and exhibited,

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* Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. pp. 112, 113.

† Haller, Disput. Anat. vol. vi.; Obs. Med. Miscell. 18.

according to this last author, an union of the two ends of the bowel, and their consolidation with a part of the abdomen. Now, it has been reasonably questioned, whether the union here spoken of ever really happened. When the upper end of the bowel is introduced into the lower, the external surface of the former is put in contact with the inner one of the latter; a serous membrane is placed in contact with a mucous one. These heterogeneous structures, Richerand alleges, are not disposed to unite. The mucous membrane, when inflamed, more readily secretes a kind of mucus, which must be an invincible obstacle to adhesion. He thinks it therefore more than probable, that, in the case related by Heister, the invagination was maintained by the union of the intestine with the corresponding part of the abdominal parietes. Several experiments on living animals have convinced him, that this happens, and that the mucous membrane will not unite with the external peritoneal coat. If this be a fact, it is of course a strong argument against repeating Ramdohr's practice. Another objection is, that the upper end of the bowel cannot be put into the lower one, unless it be separated from a part of the mesentery, and a division of the mesenteric arteries would cause a dangerous bleeding. In vain did Boyer tie seven or eight of these vessels; his patient died with an extravasation in the abdomen. * The difficulties, encountered by Moebius and Dr. Smith in their attempts to repeat this experiment on animals, are related in my dictionary, and I need not, therefore, expatiate upon them. In short, experience is decidedly adverse to Ramdhor's practice, either in its original form, or modified by the ingenious introduction of cylinders of isinglass, pasteboard, &c. Flajani tried the artifice on several patients under his care, in the hospital at Rome, but death was invariably the consequence. † I am of opinion, that Mr. Travers deserves the thanks of the profession, for the attention and talent with which he has investigated the subject before us; but, with respect to the question of sutures, I apprehend, that he has gone too far, much too far, when he declares, that, in order to avoid abdominal effusion, the suture employed should be such as will secure the absolute contact of the everted surfaces of the divided ‡ intestine.

When the intestine has been completely divided with a cutting instrument, Scarpa § is decidedly of opinion, that Ramdhor's operation cannot be undertaken with any probability of success. But, setting out of the question this bold method, at once so amusing and captivating to the inexperienced student, this eminent professor offers a variety of arguments against sewing the intestines at all, and

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* Nosogr. Chir. t. iii. p. 345, &c. edit. 4.

† Collezione d'Osservazioni, &c. di Chirurgia, tomo iii. p. 60. 8vo. Roma, 1802.

‡ Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 121. and p. 134.

§ Sull' Ernie Memorie Anatomico-Chirurgiche; mem. iv. fol. Milano, 1809.

asserts, that, *in all cases of penetrating wounds of the abdomen, attended with injury of the intestine, whether the canal be opened longitudinally, or transversely, a suture is always not merely useless, but even dangerous and fatal.* In whatever manner it is practised, says he, one cannot avoid the evils which must originate from the punctures, however few, and from the passage of the ligatures through the coats of the intestine; a part endued with exquisite sensibility, and whose external tunic is much disposed to inflame, and rapidly to communicate the inflammation to all the other abdominal viscera. It has (says Scarpa) been unfortunately proved, by the experience of several ages, that, in most of the cases, in which the intestine has been stitched in penetrating wounds of the belly, the patients have died in the greatest agony. If a few escaped the dangers of this operation, it was only because in them the stitches soon cut their way out, and were voided with the feces, which continued to escape from the wound until it was entirely healed.

All surgeons of experience, and particularly those of large hospitals, have often seen wounds of the right or left iliac region, accompanied with injury of the great intestine. They may also have noticed in these examples, that, after the subsidence of the local and general inflammatory symptoms, the wound still continues to discharge feces for a certain time; but that afterwards it contracts, and the excrement resumes its usual course. These wounds almost always heal * completely: first, because the adhesion of the large intestine to the parietes of the abdomen prevents the feces from being extravasated in the cavity of the peritoneum; and, secondly, because the ample capacity of the same bowel always presents a ready passage for the feces, notwithstanding the progressive, and sometimes quick, closure of the external opening.

If, in the instance of a penetrating wound of the belly, attended with injury of the small intestines, it were in the surgeon's power (as indeed it is) to return the bowel into the abdomen, so that the opening in it may exactly correspond to the wound in the abdominal parietes, there could not be a doubt of its quickly acquiring adhesions to the peritoneum, which lines the part around the internal orifice of the external wound. Hence, the feces would readily escape from the outer wound, and at length the artificial anus would close, and the feces resume their natural course, just like what happens in wounds of the large intestines. The narrow diameter of the small intestines would not make an insurmountable obstacle to the passage of the feces, if these were, as they usually are, in this part of the alimentary canal, in a sufficiently fluid state; and besides (as Scarpa observes), is it not proved by experience, that they resume their natural course, after the cure of an artificial anus, even when a considerable noose of the small intestines has been destroyed by gangrene, and when the two ends form by their reunion a very acute angle? Scarpa then feels no hesitation in admitting the possibility of curing wounds of the small intestines, without having recourse to a suture. It would not, he says, be difficult to quote examples of such cures; and one is related, which fell under his own observation. He afterwards describes the incessant pressure made by the abdominal muscles and diaphragm upon all the viscera, as the cause which makes the wounded intestine enter the external wound, and soon adhere to its edges, instead of quitting it. When these adhesions are formed, all danger of extravasation is over. He observes, that one should neglect no remedies, internal as well as external, which may be of use in moderating the patient's sufferings, diminishing the impetus of the circulation, and bringing the inflammation down to the degree suited to the formation of adhesions. He recommends keeping the external wound open, with the same precautions, and according to the same indications, which are to be attended to in the treatment of an artificial anus. The principal object of these precautions is to let the treatment be such, that the external wound may only diminish in proportion as the evacuation from the lower part of the intestinal canal increases.

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* See Larrey's Mém. de Chir. Mil. t. ii. p. 161.

The very nature of the process, by which the reparation of wounds of the bowels is effected, is a weighty argument against the employment of a suture. In their cicatrization, they follow quite a different course from that of simple wounds of the skin, muscles, or any other parts of the body. Their edges never become immediately applied to each other, and therefore, strictly speaking, they do not reunite. Their cure is altogether completed through the medium of the surrounding parts; that is to say, by the adhesions which the intestines contract with the great sac of the peritoneum lining the cavity of the abdomen, or with the productions of this membrane, which compose the external covering of the greater part of the viscera. *

Even from the description which Mr. Travers has given of the process of reparation, in the cases where sutures are employed, we may conclude, that the stitches can be of little service; for, says he, "the action of the longitudinal fibres being opposed to the artificial connection, *the sections mutually recede as the sutures loosen by the process of ulcerative absorption.*" † Unless, therefore, it be allowable to suppose, not only that the divided portions of bowel can be sewed together so closely and accurately at every point as to remove all possibility of effusion of its contents, but that this can also be done without risk of exciting inflammation of the bowel, thus handled, dragged, and stitched, I must fully agree with Scarpa, respecting the impropriety of thus boldly sewing up wounds of the bowels with as little scruple as a hole in a glove.

In some former editions, I have said, that if a case were to present itself, in which a protruded intestine were extensively cut, or its whole diameter completely divided, I should venture to make a single stitch with a small needle and piece of fine silk. But subsequent reflection and information make me doubt, whether this limited employment of the needle would be necessary; and if not necessary, it would undoubtedly be improper. The following case, which as well as Ramdohr's memorable experiment, is at variance with another statement, that wounds amounting to a direct division of the canal are irreparable, and therefore invariably fatal *, furnishes an unequivocal proof, not only that an intestine may be completely cut through, and the injury not always be fatal; but that the cure may be effected without any stitching whatever of the bowel. At the assault of Cairo, in 1799, M. N... was struck by a ball, which divided the muscular parietes of the abdomen, and a portion of the ileum. The two ends of the bowel protruded, were separated from each other, and very much distended. The upper end was everted, its contracted edge strangulating the intestinal tube, as the prepuce does the penis in paraphymosis. The progress of the contents of the bowel being thus obstructed, they accumulated above the constriction. Larrey began with making four small incisions in the constricted part of the intestine; he then passed a ligature through the portion of mesentery corresponding to the two ends of the bowel; reduced them as far as the edge of the opening, which he took care previously to enlarge; and, having dressed the wound, he awaited events. Without detailing the subsequent particulars of the case, suffice it to say, that, in a few months, it ended in a perfect recovery. †

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* See Case recorded by Littre in Acad. Royale des Science, an. 1705.

† Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 28.

It is curious that Flajani, who has so decidedly reprobated Ramdohr's pratice, and mentioned facts against it from his own experience, should recommend stitching a wounded and protruded bowel in any manner; for, with the exception of his unfortunate trials of inserting one end of the bowel into the other in the cases which occurred in the hospital at Rome, he records only two instances in which he stitched the intestine, and, in both these, the bowel became gangrenous, and the patients lost their lives. ‡ We may therefore infer, with Mr. John Bell, " that if there be a work of supererogation in surgery, as I believe there are but too many, surely this of sewing an intestine is one.‡

Every reflection, then, which I can make on this subject leads me to adopt Scarpa's sentiments, in relation to sutures, and the indications, which should be fulfilled. The chief indication, and that, on which the patient's safety mainly depends, consists in

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* Op. cit. p. 153.

† Larrey, Mém. de Chir. Militaire, t. ii. pp. 160, 161.

‡ Collezione d'Osservazioni, &c. di Chirurgia, t. iii. p. 35—41. In one case, the protruded bowel was a portion of jejunum; in the other, a piece of colon.

§ Discourses on the Nature and Cure of Wounds, edit. iii. p. 320.

keeping the external wound open, in order that the feces may find a ready outlet. The wounded bowel soon contracts adhesions to the inner lips of the wound of the belly, and then we have nothing to fear from an extravasation of intestinal matter in the cavity of the peritoneum. Afterwards, in proportion as the feces resume their natural course, the external wound is to be allowed to diminish, and entirly heal up.*

In every instance of a penetrating wound of the abdomen, attended with injury and protrusion of a portion of the intestinal canal, the displaced part is to be reduced, whatever we may choose to do in respect to the free or limited employment of stitches, or their absolute rejection. The reduction should be performed as speedily as possible, before the bowel has suffered much from exposure, constriction, &c. and also before any adhesions have formed at the inner orifice of the external wound; adhesions, which would make the reduction of the protruded part impracticable. Of course, when the wound is so small, that the reduction cannot be effected without handling and bruising the bowel immoderately, it ought to be carefully enlarged with a curved bistoury, guided on a director. Indeed, according to Scarpa's principles, one would suppose, that the wound, if not free, should always be dilated, as by this means the ready escape of any extravasated matter would be insured. The rest of the treatment consists in antiphlogistic measures, more especially copious and repeated vensection, with the view of counteracting the danger of peritoneal inflammation. With respect to the dressings, they cannot be too light, simple, and superficial, except when the stoppage of evacuation in the natural way, and the issue of the intestinal contents from the breach in the bowel, are such as to lead us to adopt particular means for hindering a premature closure of the external wound.

The pressure of the elastic bowels, and of the diaphragm, and abdominal muscles, not only frequently presents an obstacle to the wide diffusion of extravasated matter, but often propels it towards the external wound.† We can conceive no power capable of overcoming the resistance so produced to the extensive dispersion of extravasated fluids in the cavity of the abdomen. Numerous cases are on record, of persons being stabbed, or shot, through the body, without any effusion in the abdomen, or other very serious consequences. In some few of these instances, the bowels perhaps might have eluded the ball, or point of the weapon; yet it is highly probable, that, in most of them, the bowels were injured, and that an extravasation of the intestinal matter was impeded by the pressure, to which I have referred. In many of the cases, the intestines were known to be wounded.*

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* Scarpa sull' Ernie Memorie Anotomico-Chirurgiche, mem. 4.

† On this subject, I would particularly recommend the reader to consult two essays by M. Petit le Fils, one entitled "Essai sur les Epanchemens et en particulier sur les Epanchemens de Sang;" the other, "Suite de l'Essai sur les Empanchemens," in Mém. de l'Acad. de Chir. tom. ii. and iv. 12mo.

PENETRATING WOUNDS, ATTENDED WITH INJURY OF THE VISCERA, BUT NO PROTRUSION.

A wound of the intestines is indicated by the discharge of blood with the stools, and sometimes by the escape of fetid air, or of intestinal matter from the external wound. Such an injury, however, when the wounded bowels lie concealed in the belly, does not always admit of being immediately known with certainty. In the majority of examples, there is at first no escape either of air, or of the contents of the bowels, from the external wound; the quantity of blood, voided per anum, may be inconsiderable; and however this may be, none at all will generally be discharged downwards, until a certain time after the accident. Wounds of the small intestines, especially of the duodenum and jejunum, are indeed usually followed by great anxiety, paleness of the countenance, syncope, cold perspirations, and a small, intermitting, tremulous pulse; but, these symptoms are far from being unequivocal, and they cannot be said to furnish any positive information, because a superficial cut, or unimportant stab, frequently causes similar indisposition in subjects of nervous, irritable, or timid habits. Our inability, however, to say positively in every case, whether the bowels are injured or not, is of no practical importance; because, when the nature of the accident is not clearly manifested by some peculiarity or severity of the symptoms, the case ought to be treated on common antiphlogistic principles; and also when circumstances leave not the smallest doubt of the intestines being hurt, the same treatment is the only rational plan. Wounds of the small intestines are more dangerous, than those of the large; and the nearer the injury is to the pylorus, the greater is the risk. Such cases are also much more frequently than injuries of the large intestines, the cause of extravasation. In the latter examples, the symptoms are generally milder, and either the passage of the intestinal contents outward through the wound more easy and certain, on account of the bowel being more fixed, than the rest of the intestines; or their passage towards the anus more ready, by reason of the greater capacity of the cœcum, colon, and rectum.

There are several other facts highly interesting, and absolutely necessary to be remembered in considering wounds of the bowels: my limits, however, oblige me to pass over the rest of this subject with as much brevity as possible; for which, the fuller account in my dictionary will also afford a just excuse. Were it not for these considerations, I should have felt myself obliged to enter into explanations of the particular appearances presented, as well by punctured wounds, as by transverse and longitudinal cuts in the intestinal canal; and to comment on the circumstance of small punctures being obliterated by the protrusion of the villous coat. I should also have had to point out the results of Mr. Travers's experiments on dogs, proving that, in these animals, a division of the small intestine as far as the mesentery, is always fatal; that generally in wounds of the intestinal canal, the retraction, immediately following the injury, is a chief obstacle to its reparation; and that longitudinal wounds of the bowels are more easily repaired, than such as are tranverse. This tendency of the two portions of a divided bowel to recede from each other tends to show, that the only mode of spontaneous reparation consists in the formation of an adventitious canal, by the encircling bowels and their appendages.

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* Recoveries are recorded in Wiseman's Surgery, p. 571. Œuvres de Paré. liv. x. chap. 55.; La Motte, Traité Complet de Chir. Albucasis, lib. ii. cap. 26.; Ravaton, Traité des Playes d'Armes à Feu, chap. 6. &c. &c.

In the preceding part of this chapter, I have adduced many arguments, casting doubt on the propriety of sewing up a wound in a protruded bowel; but, when the injured intestine lies in the cavity of the belly, the rashest surgeon, the greatest admirer of needles, would never think of ripping open his patient for the sake of performing so cruel and fatal an experiment. In fact, as I have already stated, we rarely know at first, that the bowel is injured; for extravasation, as will be presently related, is not the most usual consequence of a wound of an intestine; when it happens, the extravasated matter does not always flow out of the external wound, and indicate the nature of the accident; and, if an extravasation should become manifest in a later stage of the case, it would then be impossible to get at the wound of the bowel, on account of the adhesions, which generally form with surprising rapidity. Even if the wound of the intestine were known to exist directly after the receipt of the injury, and a suture were not objectionable, on grounds already detailed, it could not be applied, without enlarging the external wound, searching for the wounded bowel, and drawing it out of the cavity of the abdomen. By these steps, a wound, not at first essentially fatal, might be so altered for the worse, so as to leave no possibility of recovery. When an intestine is first found to be wounded, from the occurrence of extravasation a day or two after the injury, a suture is entirely out of the question, as by this time, the part is entirely fixed in its situation by the adhesive inflammation, that salutary process, which also circumscribes the effusion, and throws out an effectual partition between the extavasated fluid and the general cavity of the peritoneum.

When the wound of the intestinal canal is situated in the abdomen, closely behind the external wound, a suture is also unnecessary, because if care be taken to keep that opening from closing too soon, the contents of the gut will be discharged outwardly, and there will be no reason to fear their diffusion among the viscera. Nor is the wounded bowel at all likely to slip away from the outer wound, if the patient be kept duly quiet for a few hours, after which the adhesions render a change in the situation of the bowel quite impossible.

In a penetrating wound of the abdomen, caused either by gunshot or a pointed instrument, if no protrusion of intestine take place, the lancet, abstinence, and quietude, should be our chief dependence. In short, as the main danger is inflammation of the peritoneum and bowels, the rigorous adoption of antiphlogistic treatment is indispensable. Pain and tension must be relieved by leeches, fomentations, and the warm bath; and if any purgative medicine be given, (which, however, I think should never be done before time has been afforded for the formation of adhesions,) it should be of the mildest description possible. Castor oil is perhaps the safest which can be employed. In these cases, indeed, clysters are generally to be preferred to any other means of emptying the bowels. By the simple observance of an antiphlogistic plan, wounds, in which several folds of the bowels were hurt, have been happily cured. Authors abound with instances of this kind. One related by Littre, I have already referred to in this chapter. Garengeot and La Motte record others; and Dr. Hennen has seen several: one was the recovery of a soldier, who had been shot through the abdomen with a ramrod at the siege of Badajos, in 1812. The instrument entered the front of the abdomen, and actually stuck in the vertebræ, from which it could not be disengaged without force.*

Patients, who have recovered from wounds of the bowels, should afterwards be extremely temperate in their diet, and, above all things, avoid taking any kind of flatulent, stimulating, indigestible food. They must also be very careful to keep their bowels regular.

In all cases of penetrating wounds of the belly, the dressings should be light, simple, and superficial. If excrementitious matter be discharged from the opening, the utmost attention must be paid to cleanliness. We should also recollect the precept inculcated by Scarpa, viz. that the external wound should only be allowed to close, in proportion as the feces resume their natural course, with ease and regularity.

Sometimes the intestinal matter continues to be discharged for a considerable time from the wound, and even during the rest of the patient's life, either through a fistula, or an artificial anus. In general, however, this affliction gradually ceases. In almost every collection of cases, we may find examples fully proving, not only that simple stabs of the bowels in the end get well, without leaving a permanent annoyance of this kind, but that large portions of the bowels may even be destroyed by gangrene, and yet the continuity of the intestinal tube be completely re-established. From the facts quoted in this chapter, it would also appear, that a complete division of a bowel is neither certainly fatal, nor necessarily followed by an irremediable artificial anus.

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* Obs. on Military Surgery, p. 436, 437.

Balls, shot into the abdomen, are occasionally discharged with the stools.

EXTRAVASATION.

An occasional consequence of a penetrating wound of the abdomen, is an extravasation in the cavity of the peritoneum. The extravasated matter may be undigested food, chyle, the succus pancreaticus, feces, bile, urine, blood, &c. according to the nature of the injured parts. Fortunately, this kind of accident is far less frequent, than an inexperienced surgeon would apprehend, or than our hearing so much of the *cavity* of the abdomen would lead us to expect. Strictly speaking, no empty space exists within the animal body; and all the parts contained in the abdomen are in close contact with each other, and with the inner surface of the peritoneum. Hence, except under particular circumstances, though the bowels may be wounded, extravasation is generally prevented altogether; or when it does happen, is seldom extensive, the effused matter all lying in one mass.

If, immediately after a wound of the belly, and of its contents, it be the compact state of the contained and containing parts which at first hinders extravasation, it is that salutary process, the adhesive inflammation, which afterwards renders the occurrence quite impossible; or bounds and circumscribes the effusion, if it should have already taken place. In fact, all the surfaces, in contact with each other, and surrounding the track of the wound, become generally so intimately connected together, by the adhesive inflammation, that the wound forms a sort of canal, entirely destitute of all communication with the cavity of the peritoneum; and the rapidity with which such adhesions occur is very great.

When an extravasation is diffused in various degrees over the abdomen, Richter thinks we may generally account for it by the patient having been moved about too much; or by his having suffered violent spasmodic contractions of the intestines, arising from the irritation of the extravasated matter. Urine and bile are more frequently dispersed among the convolutions of the viscera, than blood, chyle, or any other fluid.

According to the investigations of Mr. Travers, the following are the only circumstances, in which an effusion of the intestinal contents can happen. If the gut be full, and the wound extensive, the surrounding pressure is overcome by the natural action of the bowel tending to the expulsion of its contents. But, in defect of either of these states, effusion cannot follow. When, however, air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen, at the time of the injury, the resistance, made to effusion, will be less effectual, although the pressure of the sides of the abdomen is the same, as such fluids will yield more readily than the solids naturally in contact with each other. Effusions are also stated more generally to follow ruptures of the bowels by blows, or falls upon the belly, than ordinary penetrating wounds.*

When an extravasation is perceived, in the first instance, a part of the wound is to be left open, and the posture of the patient is to be so regulated, that the wound may be as depending as possible, and the effused fluid readily escape. If the extravasation should not be perceived till after the wound has been dressed, we are directed to remove the means employed to close a part of it, and to place the patient in a proper posture, with a bandage applied round his body. When internal hemorrhage is suspected, cold washes and venesection are recommended.

When symptoms of irritation exist, attended with local inflammation, pain, and a fluctuating tumour, denoting the seat of the extravasation, the effused fluid is to be let out by a puncture.† In the Memoirs of the Academy of Surgery may be found observations, recorded by Petit and Le Vacher, illustrating the advantages of such treatment.

When there are no symptoms denoting the exact seat of the extravasation, antiphlogistic means, a suitable posture, and the introduction of a tube into the wound, are the measures which writers then usually recommend. For my own part, I would restrict the treatment to the prevention, or diminution, of inflammation, as here no benefit can be derived from posture, nor from a tube, which does not exactly reach the effused fluid; and the former must often be irksome, and the latter always irritating. Venesection should be freely and repeatedly performed; the belly fomented two or three times a day; and only the lowest regimen allowed. A bandage should be applied round the body, as a rational means of promoting that compact state of all the parts in the abdomen, by which the ill consequences of extravasations are so materially diminished.

Musket balls sometimes pierce and lodge in the bladder, in which circumstances, a surgical operation, resembling lithotomy, will become necessary, as soon as the dangers of the first injury are past.‡ In wounds of the bladder, a great deal of difference in the degree of danger will depend upon whether this organ happens to be full of urine at the time of the accident, and whether the injured part of it is one, over which the peritoneum is reflected. In all cases, however, the principal danger depends upon the chance of the urine becoming effused, and exciting inflammation and gangrene of the peritoneum, bowels, cellular membrane, and, in short, of every part with which it comes into contact. The obvious indications are to make a free and depending outlet for any urine already effused; to prevent a further extravasation by the continual use of an elastic gum catheter; to keep down and diminish inflammation by copious bleeding and low diet; and to avoid every sort of dressing at all likely to irritate or obstruct the wound itself. The best applications, indeed, are light, simple pledgets, with the strictest attention to cleanliness. The cases are now numerous, in which very considerable wounds of the bladder terminated favourably under such treatment.* Wounds of the bladder are often rendered more dangerous, by being complicated with injury of the intestines.

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* See an Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. p. 25—36.

† Richter's Anfansgr. der Wundarsneykunst, band. v. p. 38.

‡ See Larrey's Mém. de Chir. Mil. t. iv., and Hennen's Mil. Surgery.

CHAP. XXXIV.

PSOAS ABSCESS.

This signifies a collection of matter, which usually forms behind the peritoneum, in the cellular substance surrounding the psoas muscle. The origin of this disease is not, in general, attended with any symptoms of acute pain and inflammation, nor with any febrile disturbance of the constitution. There is a dull uneasiness in the region of the loins; but this, so far from leading to a suspicion of the nature of the disease, is usually regarded as rheumatic. The matter is formed slowly, and imperceptibly, and occasions, at first, no manifest swelling, nor fluctuation, and no material symptom whatever, excepting the uneasiness in the loins, and a slight weakness of the thigh and leg on the affected side.

While the abscess is attended with no external tumour, the diagnosis is always difficult, and any opinion, founded on the existing symptoms, is very undeserving of implicit confidence.

The outward swelling, at length occurring, may take place in various situations. For the most part, the matter descends in the course of the psoas muscle, passes forward under Poupart's ligament, and occasions an external, fluctuating tumour, quite free from pain and inflammation. The exemption from the latter circumstances is a clear indication, that the matter is not originally formed at the place where it first makes its appearance. The enlargement of the swelling, when the patient draws in his breath; its diminution when he is in a horizontal posture, and when pressure is made;

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* Such facts are abundant in Larrey's excellent work, especially the 4th vol. Flajani relates another case, in which the means were restricted to antiphlogistic remedies, Collez. d'Osservazioni, t. iii. p. 59. Thomson saw fourteen examples of wounded bladder recovering. See Obs. in the Military Hospitals in Belgium, p. 108, &c.

and lastly, the fluctuation perceptible to the surgeon's fingers, when the patient coughs, are circumstances which, combined with the other preceding complaints, clearly evince the nature of the case.

The swelling in the groin seldom becomes very large, because the matter insinuates itself beneath the femoral fascia. In some instances, it descends as far as the knee, where it forms a prominent swelling. Sometimes it makes its way downwards into the pelvis, and occasions a swelling in the neighbourhood of the anus. Sometimes it tends towards the loins and sacrum, giving rise to a swelling exactly in the place where abscesses often make their appearance in the disease of the hip-joint. In a few instances, the matter causes a swelling in the vicinity of the vertebræ; and, less frequently still, it makes its way through the abdominal muscles, and produces a tumour at some part of the abdomen.

The disease, even before it bursts, or is opened, is frequently attended with loss of appetite, weakness, nocturnal sweats, and other hectical complaints.

Lumbar abscesses are sometimes attended with a carious state of the vertebræ. The affection of the bones is by some considered as a cause; by others, as an effect of the rest of the disease.

The causes of a psoas abscess are frequently involved in great obscurity. Sometimes, the disease is preceded by a violent strain of the loins; but, very commonly, we cannot trace any valid reason for its occurrence.

In considering suppuration, I have recommended, as a general rule, liable to particular exceptions, that acute abscesses ought to be allowed to burst spontaneously. With respect to chronic abscesses, an opposite piece of advice seems proper, and surgeons may generally decide to open them, as soon as their existence is known. If not opened, they do not make their way through the skin for a very long time, during which period, the quantity of matter is continually increasing, and the cavity of the cyst becoming larger and larger. Psoas abscesses cannot be opened before the swelling occurs, on account of their very deep situation, and the difficulty of knowing their existence with certainty. But, when the swelling and fluctuation are evident, the sooner the matter is discharged the better.

Experience shows, that, when a psoas abscess is opened in the common manner, death in general follows sooner, than when the swelling is allowed to burst of itself. The formation of a large opening, but particularly the aperture being afterwards left unclosed, causes an inflammatory affection of the whole cyst of the abscess, and the most violent description of constitutional disturbance. The discharge is profuse, thin, and fetid. The patient's pulse becomes small, rapid, and irregular; copious perspirations, unremitting diarrhœa, and even delirium ensue, and death very commonly closes the scene.

Hence, several practitioners* are in favour of letting lumbar abscesses burst spontaneously. But, though I must assent to this practice being better, than making a large puncture, and leaving it open, yet I have to remark, that whoever expects the symptoms to be mild on the abscess bursting of itself, will generally find himself deceived. Violent irritation of a hectical constitution usually ensues, and the patient mostly falls a victim.

On the other hand, I have had so many opportunities of appreciating the practice, recommended by Mr. Abernethy† in these cases, that I must consider it, in the present state of surgery, as the only one warrantable. By it, the severe symptoms, under which patients used formerly to perish, when the abscess burst, or was punctured, and the opening left unclosed, are for the most part avoided, and recoveries are rendered more frequent.

This gentleman's method is to open the tumour with a broad abscess lancet, observing to introduce the instrument somewhat obliquely. Such an opening is generally sufficient for the discharge of the coagula, commonly blended with the contents of lumbar abscesses.

The abscess being completely emptied, the lips of the orifice are to be brought together with sticking plaster, and a compress and bandage applied. The wound generally heals, without trouble.

The matter of course collects again, and, regularly as it is secreted, descends to the lower part of the cyst, on which account the upper part of the cavity will remain a good while undistended, and have an opportunity of contracting. When the integuments are again sufficiently elevated to allow a puncture to be made, without hazard of wounding the subjacent parts, the abscess is to be emptied again, and the wound healed, in the manner above described. Thus the operation is to be repeated as often as may be necessary.

By this method, the cyst of the abscess, particularly its upper portion, is not allowed to be distended, and its cavity gradually diminishes in size.

In conjunction with this treatment, attempts may be made to promote the absorption of the matter by electricity; giving two or three times a week a scruple of sulphate of zinc as an emetic; and by blistering the integuments. Care should be taken not to apply the blister at a part where it may be necessary to make a puncture in the abscess. A discharge should be kept up from the blistered surface by means of the savine cerate. When there is reason to suppose the vertebræ diseased, issues are sometimes beneficial.

When the abscess seems disposed to burst by ulceration, the event may sometimes be prevented by a timely puncture made at a part of the tumour, where the integuments are free from inflammation.

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* Pearson in his Principles of Surgery, p. 112. Pelletan in his Clinique Chir. tom. iii. p. 322.

† On Chronic and Lumbar Abscesses, in Surgical Works, vol. ii.

CHAP. XXXV.

PARACENTESIS ABDOMINIS.

This operation consists in making an opening into the cavity of the peritoneum, for the purpose of discharging the fluid collected there in dropsical cases.

The proper instrument for making the opening is a trocar, with a cannula, through which the fluid can readily escape.

Not many years ago, it was the invariable practice to introduce the instrument at the central point of a line, drawn from the umbilicus to the anterior superior spinous process of the os ilium, and on the left side, in order to avoid all risk of injuring the liver.

Modern practitioners usually prefer making the puncture in the linea alba, for several weighty reasons. The first is, that in the other method, you are not sure of introducing the instrument in the exact situation of the linea semilunaris, and consequently may unnecessarily wound the thick muscular parietes of the abdomen, instead of merely a thin tendinous part. Another reason is, that, in the attempt to tap in the linea semilunaris, the epigastric artery has sometimes been wounded by very skilful men. In dropsical cases, the rectus muscle is frequently much broader, than in a healthy subject; and, as it always yields to the distention of the fluid in a greater proportion than the lateral layers of muscles, the above measurement is very likely to cause the wound to be made near the course of the epigastric artery.

When the operation is to be performed in the linea alba, the instrument should be introduced about two or three inches below the navel.

As soon as the trocar meets with no further resistance, it is not to be pushed more deeply without any object, and with a possibility of injuring the viscera. The stilet is now to be withdrawn, the cannula pressed a little further into the opening, and the fluid discharged through it.

In consequence of the sudden removal of the pressure of the fluid from the viscera and diaphragm, patients are very apt to swoon, and even become affected with dangerous symptoms. In order to prevent these unpleasant occurrences, the abdomen is to be compressed with a bandage or belt, during the discharge of the fluid, and afterwards covered with a flannel compress, and roller.

In cases of ovarial dropsy, the tumour inclines towards one or the other side of the abdomen, so that the puncture cannot be made in the linea alba, but should generally be made at the point, where the swelling is most prominent, due care being taken to avoid the epigastric artery.

CHAP. XXXVI.

HERNIA.

A PROTRUSION of any of the parts, naturally contained in the abdomen, beyond the proper extent of that cavity, not the immediate effect of a penetrating wound, is named a *hernia.*

In common language it is called a *rupture;* an erroneous idea having been formerly entertained, that the case was always attended with a laceration of the peritoneum.

In general, the most moveable viscera are the most liable to protrusion. Hence, the omentum and intestines, which are loose and unfixed in the cavity of the belly, are met with in almost every hernia, while the stomach has seldom been observed in such a tumour, and still more rarely the spleen.* The liver, being connected with the diaphragm, is not subject to complete displacement, though a portion of it has been noticed in large herniæ at the navel.† The uterus‡, ovaries§, and bladder‖, however, are liable to protrusion.

But, putting out of present consideration less common cases, in which occasionally few of the abdominal viscera have not been more or less protruded, the usual contents of a hernia are either a portion of intestine or omentum, or of both these parts together.

When intestine alone is contained in the hernia, the case is termed an *enterocele;* when omentum alone, *epiplocele;* and when both are included in the tumour, it is named an *entero-epiplocele.*

When a hernia contains a part of the stomach, liver, or bladder, it is sometimes named accordingly, *gastrocele, hepatocele,* or *cystocele.*

Besides this division of herniæ into several kinds, deduced from the nature of their contents, there are other surgical distinctions, derived from their situations. Thus, when any of the contents of the abdomen slip through the abdominal ring into the groin, the case is termed a *bubonocele,* or *inguinal hernia;* and when the parts descend lower, into the scrotum or labia pudendorum, the hernia is called an *oscheocele.* The name of *femoral,* or *crural hernia,* is applied to that which occurs below Poupart's ligament, and is most frequent in women. When any of the abdominal viscera are protruded at the navel, the tumour is termed an *umbilical hernia*, or *exomphalos.* The hernial tumours, which take place below the pubes, near the attachment of the superior head of the triceps and pectineus, are called *herniæ of the foramen ovale.* Sometimes the hernial tumour projects into the vagina, and is named accordingly hernia vaginæ; while such protrusions as happen at parts of the abdomen, not comprehended in the preceding account, are called *ventral herniæ.*

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* Ruysch, Advers. Dec. 2.

† Gay, Nourse, and Bohnius: see Pott's Chirurg. Works, vol. ii. p. 121. edit. 1808.

‡ Chopart and Desault, Traité des Mal. Chir. tom. ii. p. 3.; also Ruysch, Hildanus, and Sennertus.

§ Pott, vol. ii. p. 126.

‖ See particularly Récherches sur la Hernie de la Vessie, par M. Verdier, in Mém. de l'Acad. de Chir. tom. ii.; Pott's Works, vol. ii. p. 206. edit. 1808.; Mery, Obs. sur differentes Maladies, in Acad. Royale de Sciences, an. 1713. Ruysch, Obs. Anat. Chir. Centuria, Obs. 98.; Keate's Cases of Hydrocele, &c. &c.

One very particular case is termed *hernia congenita.* It exists from the time of birth, and in it some of the abdominal viscera are actually lodged in the tunica vaginalis, in contact with the testicle. Haller and John Hunter seem equally deserving of the honour attached to the explanations of the nature of this particular case.*

Some years ago the late Mr. Hey discovered a new species of hernia congenita, to which he gives the epithet *infantilis,* as it can only exist while the parts retain the state peculiar to early infancy. The particularity of the hernia congenita infantilis, consists in the hernial sac being contained in the tunica vaginalis of the testicle. This case differs from the common scrotal rupture, in which the hernial sac lies on the outside of the tunica vaginalis, and also from the common hernia congenita, in which the protruded viscera are in contact with the testicle, and have no hernial sac, except the tunica vaginalis. †

In common cases, the contents of a hernia are always included in a complete membranous pouch, which is derived from the peritoneum. This membrane, as every novice in surgery knows, lines the whole cavity of the abdomen; and when any viscus protrudes out of the belly, it necessarily carries before it a portion of the elastic bag, in which it is naturally included. Such is the simple manner, in which a *hernial sac* is formed. The hernial sac is generally described as becoming thicker and thicker, and as presenting, in herniæ of long standing, the appearance of a dense thick membrane, composed of several layers, easily separable by dissection. But Scarpa assures us that, in the majority of cases, the hernial sac, strictly so called, does not become perceptibly thickened, and that whatever may be the magnitude, or long-standing of a scrotal hernia, the sac is generally not different from the rest of the peritoneum. The differences, remarked in the thickness and strength of the coverings of a hernia, he says, are not to be referred to the hernial sac; but to certain investments, which are external to it, as for instance, the elongation of the fascia lata, the muscular and aponeurotic sheath of the cremaster, and cellular substance, which is on the outside of the hernial sac. The thickening of these various investments is, no doubt, the effect of the pressure, which is continually made upon them by the displaced viscera.* Schmucker† informs us, that he met with a very thin hernial sac in a man who had been afflicted for twenty years with a large scrotal hernia; but, as Scarpa observes, this fact, which is related as singular, is on the contrary very common. Le Blanc ‡ and others have noticed that, in crural herniæ, which are not covered by the cremaster muscle, the hernial sac is always thin, and completely similar in structure to the healthy peritoneum. Scarpa infers, therefore, that whenever, in operating upon a recent inguinal hernia, of moderate size, the hernial sac has been found of a thin texture, like the peritoneum, the cellular substance which covers it, immediately below the cremaster muscle, must have been divided, without having been perceived; and on the other hand, that, in operating upon old scrotal herniæ, of great size, the cremaster and subjacent cellular membrane, which, in such cases acquire considerable thickness and strength, have been mistaken for the hernial sac.

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* See Haller's Programma, herniarum observationes aliquot continens. Goetting. 1749. His Opuscula Pathologica and also Opera Minora, tom. iii. The programma appears to be by far the earliest publication on the subject. Hunter's Med. Commentaries seem not to have made their appearance till 1762.

† Hey's Practical Obs. in Surgery, p. 230. edit. 2.

The foregoing statement, however, is allowed by Scarpa to have exceptions; and he admits, with the generality of other surgical writers, that, in certain instances, the hernial sac itself becomes much thicker, than the rest of the peritoneum; especially when the hernia, after being for a long while reduced, protrudes again, and is not kept up; when the tumour has been repeatedly affected with inflammation; or when there are extensive adhesions between the hernial sac and its contents. § When the hernia is very large, the hernial sac sometimes grows thinner, instead of becoming thicker, in proportion to the size and duration of the tumour. This diminution of the thickness of the sac and more external parts may take place in so considerable a degree, as to render the convolutions, and vermicular motion, of the bowels visible through the skin. When the hernial sac has been burst by a blow, the contents of a rupture may also lie immediately under the integuments. ||

In an epiplocele, as Le Dran observes, there is nothing to be felt, except a doughy softness, which neither absolutely yields to the touch, nor very sensibly resists it. ¶ The tumour has a flabby, unequal feel; and, when there is no stricture, is perfectly indolent. It is more compressible than that arising from protruded intestine;

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* Scarpa, Traité Pratique des Hernies, trad. de l'Italien, p. 53. 8vo. Paris, 1812.

† Chir. Wahrnehmungen, 2 Th. p. 297.

‡ Précis d'Opérat. t. ii. p. 53.

§ Scarpa, Traité Pratique des Hernies, p. 56.

|| A. Cooper's Anatomy and Surgical Treatment of Inguinal and Congenital Hernia, p. 5.; Supplement au Traité de J. L. Petit sur les Mal. Chir. p. 113.

¶ Operations in Surgery, p. 73.

and when the quantity of omentum is large, the epiplocele can in some measure be distinguished by its weight.

In an enterocele, the tumour is usually more flatulent, tense, and elastic. If the intestine be distended with wind, have any degree of stricture made on it, or be inflamed, the swelling will be tense, resist the impression of the fingers, and give pain upon being handled. On the contrary, if there be no stricture, and the gut be neither distended with air nor inflamed, the tension will be trivial, and no pain will occur upon handling the tumour. When the patient coughs, an enterocele feels, as Mr. Pott observes, just as if it were blown * into. When an intestine, containing air, is reduced, it frequently occasions a guggling noise.

In the entero-epiplocele, of course, the symptoms are mixed.

Some herniæ are capable of easy and immediate reduction. This is usually the case, when the aperture through which the parts protrude, is not so small as to produce constriction, and when these same parts have not contracted any adhesions. In old cases of epiplocele, the omentum frequently cannot be reduced, in consequence of the morbid enlargement, which the protruded portion has undergone, even though its neck may not suffer any degree of stricture.

A hernia should always be reduced, if possible; and the parts kept up with a truss.

Many herniæ are incapable of reduction, though not in a state of strangulation, or inflammation; the incapacity of reduction being dependent upon the largeness and quantity of the contents of the hernial sac; a morbid thickening of them; or adhesions, which they have contracted with each other, or with the inside of the sac.

When a bubonocele is rendered incapable of reduction, in consequence of adhesions, or the largeness of its contents, it fills the scrotum, and displaces the integuments of the penis, in such a degree, that the patient is disqualified for copulation. The course of the alimentary matter is always more or less obstructed, in that portion of the intestines which composes the hernia; the patient is subject to complaints of the digestive organs, colic pains, or even a total stoppage of the intestinal contents. This last accident may arise from the matter accumulating too copiously in a part of the bowel that has lost its power of action, so that the collection continues to increase above the obstruction; or it may be produced by the protrusion of an additional piece of intestine or omentum, which causes the parts, embraced by the opening, through which the hernia descends, to become strangulated. In this last case, therefore, the viscera suffer a painful constriction; and not only is the passage of their contents impeded, but the parts, in the vicinity of the incarceration, are attacked with inflammation. Persons afflicted

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* Chirurgical Works, vol. ii. p. 21. edit. 1808.

with herniæ are incessantly exposed to these two dangers, namely, simple obstruction in the protruded bowels, and strangulation of them. The first is frequent in old subjects, and in ancient and voluminous herniæ; the second is most common in young people and adults. *

Persons, with irreducible ruptures, should avoid rough exercise; support the hernial tumour with a bandage; and carefully keep it out of the way of all harm from pressure, bruises, &c., and should avoid costiveness and all irregularity of diet.

The quiet inoffensive state of these cases is by no means to be depended upon: an inflammation of that part of the gut which is down; any obstruction to the passage of the aliment or feces through it; a stricture made on it by the opening, through which it protrudes; are circumstances always likely to put the life of the patient in danger. †

An irreducible omental hernia, free from constriction and inflammation, is not productive of immediate danger; but when affected with inflammation from any accidental cause, bad and fatal effects may be induced. A protrusion of intestine into the sac is also constantly liable to happen.

Some herniæ are reducible, but not without difficulty, and a good deal of pain and danger, either in consequence of the large size of the piece of omentum, or its inflamed state; the quantity of intestine and mesentery; an inflammation of the gut, or its distention with feces or air; or the smallness of the aperture, through which the hernia protrudes.

Other herniæ are both strangulated, and incapable of reduction, without an operation.

SYMPTOMS OF A STRANGULATED HERNIA.

The first symptoms are, a tumour in the situation of the rupture, attended with pain, not only in the part, but all over the belly; sickness, and inclination to vomit; suppression of stools, and some degree of fever. The stoppage of evacuations from the bowels, as Mr. Lawrence has observed, may not always be so clearly marked, where only a part of the diameter of the gut is strangulated; but it will often occur in as great a degree in that case, and be equally insuperable by purgative medicines, as where a complete fold of intestine is included: it even happens occasionally in a mere epiplocele. The action of a clyster on the bowels below the stricture, often produces a stool after the strangulation has taken place; but, when they have been once emptied, the most irritating clysters have no effect. ‡ If the reduction be delayed, the vomiting becomes more

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* Richerand, Nosographie Chir. t. iii. pp. 365, 366. edit. 2.

† Chirurgical Works, vol. ii. pp. 49, 50.

‡ See a Treatise on Ruptures by W. Lawrence, p. 50. edit. 4. 8vo. Lond. 1824. Both to the student and practical surgeon, this last work will be found highly instructive, every part of the subject being well explained, and considered

frequent; all the contents of the stomach, and afterwards those of the bowels, down to the stricture, being rejected. There is great anxiety and restlessness, with a small, quick, and hard pulse, and cold extremities. After a time, hiccough comes on, the pulse is hardly perceptible, respiration weak, and the whole body covered with a cold, clammy sweat. Mortification now takes place, beginning in the protruded viscera, and extending to the containing and neighbouring parts. The patient suddenly becomes easy, the swelling of the belly subsides, the tumour of the part diminishes, and the skin covering it sometimes changes its natural colour for a livid hue. Whether it keep or lose its colour, it has an emphysematous feel, a crepitus to the touch. This crepitus is the sure indication of gangrenous mischief within. In this state, the gut either goes up spontaneously, or is returned with the smallest degree of pressure; a discharge is made by stool, and the patient fancies himself better. This feeling, however, is of short duration; for, the hiccough, and cold sweats, continuing and increasing, with the addition of convulsive symptoms, death soon follows.

The symptoms of a strangulated omental hernia are less severe and rapid, and stools may generally be procured by purgatives, or clysters. However, the nausea and vomiting occur in a very distressing degree. This may be readily conceived, when the connexion of the omentum with the stomach is remembered. The same knowledge will also make us understand the effect of a bent posture in mitigating the symptoms; and of an extended one, in aggravating them. When the body of a person, who has died of a strangulated hernia, is examined, the whole surface of the peritonæum is found inflamed, the intestines participating in the disorder, particularly those above the stricture, which are considerably distended. From the constricted part downwards, the intestine is generally smaller than usual, and not inflamed. The convolutions of the bowels are also connected together by recently formed adhesions; a turbid puriform fluid, with flakes of coagulated matter, is effused in the abdomen; and not unfrequently spots of gangrene are seen on the intestines.*

CAUSES OF HERNIA.

In the healthy state, the abdomen, considered as a whole, is acted upon by two opposite forces, which counterbalance each other; one is the pressure of the viscera against the parietes of the belly; the other is the reaction of these same parietes upon the viscera, which they contain. If, as Scarpa remarks, in all individuals, and all conditions of life, these two forces were in perfect equilibrium,

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with much judgment and ability. The references inserted are truly valuable, as they at once introduce the reader to an acquaintance with all the best writers upon this important branch of surgery.

* Lawrence, op. cit. p. 55.

hernia would not take place; and if, when such equilibrium is broken, the sides of the abdomen were to yield equally at every point to the impulse of the viscera, the result would be an increase of bulk in the whole abdomen, but true hernia would never be seen. The cavity of the abdomen is always completely filled, the containing and contained parts reacting upon, and mutually pressing against each other. It is by this gentle, but uniform and uninterrupted pressure, that all the bowels reciprocally support one another; and without it, the ligaments of the liver, those of the spleen, and, in general, the various membranous bands of the intestines, would be but very inefficient means for fixing these parts in their respective situations. But, there are certain points of the abdominal parietes, which naturally make much less resistance than others, and which react far more weakly against the pressure of the viscera from within outwards. Such is especially that part, which extends from the pubes to the anterior superior spine of the ilium. This relative weakness of some points of the parietes of the abdomen is evident in certain individuals, as the effect of malformation; and it may be increased by several internal and external causes, equally numerous and diversified. In one of these cases, let the pressure of the viscera be immoderately increased, as happens in a violent effort, a loss of equilibrium between the two abovementioned forces is the immediate consequence; that is to say, the reaction of the abdominal parietes (at certain points at least) is no longer equal to the force of the impulse of the viscera. The united force of the abdominal muscles, diaphragm, and levator ani, is then directed and concentrated against the weakest point of the abdomen, to which it propels the nearest viscus, or that which, from its moveableness, is the most subject to displacement. When this viscus is a noose of intestine, the force which pushes it out of the belly must obviously act at the same time upon the corresponding portion of the mesentery; so that the bowel, as it protrudes, draws the mesentery along with it. When the viscera, disposed to protrude, meet with little resistance on the part of the parietes of the abdomen, the hernia is soon formed, and the mesentery is elongated with equal quickness. We have an example of this fact in the congenital inguinal hernia, where the bowel falls, in some measure, into a sac ready for its reception. On the contrary, in the common inguinal hernia, a totally different arrangement of the parts makes the progress of the disease much slower. In general, the hernia is not produced immediately the equilibrium, between the force of the impulse of the bowels, and the reaction of the parietes of the abdomen, is destroyed. But, in the groin, a slight elevation is first noticed, which extends from the anterior superior spine of the ilium to the abdominal ring. Some time afterwards, when the intestine has passed out of the ring, the increase of the hernia, and the elongation of the mesentery, make much more rapid, but simultaneous progress.

As Scarpa observes, a variety of practical observations concur in proving, that the proximate cause of hernia must not be imputed to relaxation of the mesentery, but rather to a loss of the equilibrium between the pressure of the viscera, and the resistance of one or several points of the parietes of the abdomen. In infants, where the neck of the tunica vaginalis is not promptly obliterated, and in subjects, who become suddenly emaciated after having been very fat, herniæ originate from the slightest causes. Women, who have borne children, are more liable to the disease than other females; and individuals of either sex, who carry considerable burdens, play on wind instruments, or receive violent contusions * of the abdomen, are also particularly exposed to ruptures, even when there is not the least reason for suspecting any relaxation of the mesentery. Herniæ of the vagina, a consequence of difficult labours, are another proof of the same truth.

When hernial patients cough, sneeze, or make the slightest effort, they immediately feel the tumour enlarge, and they hasten to support it with their hands. At the same period, the mesentery unquestionably becomes lengthened, in proportion as the bowel protrudes in a greater degree. Indeed, says Scarpa, all the viscera have such a tendency to be displaced, and propelled towards the weakest point of the abdominal parietes, that even those which are the most remote from it, and the most firmly fixed by duplicatures of the peritoneum, may, in their turn, descend into a hernia; a circumstance which anatomical knowledge alone could never have anticipated. Sandifort and Palletta found the cœcum, with a portion of the ileum and colon, in an umbilical hernia. Mauchart, Camper, and Bose, saw the cœcum in an inguinal hernia of the left side; and Lassus found the left portion of the colon protruding at the right abdominal ring.†

TREATMENT OF A STRANGULATED HERNIA.

When we reflect upon what parts are wounded by the operator; when we view the operation in an abstract light, and put out of consideration the whole of that constitutional disturbance, which invariably results from the continuance of the strangulation; there seems ample cause to believe, that the generality of fatal events, consequent to the operation, are attributable to the disease itself, and not to the attempt made for its relief. It was remarked by the late Mr. Hey, that if Mr. Pott's opinion be true, that the operation,

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* A. Cooper on Inguinal and Congenital Hernia, p. 13. Where a large portion of the abdominal parietres is weakened by a violent contusion, or the repeated distention of pregnancy, and yields, so as to form a preternatural swelling, containing some of the viscera, the case is named by the French surgeons, an "*éventration*."

"Les éventrations, ou hernies ventrales, susceptible d'engouement, ne le sont pas d'étranglement, tant est large l'ouverture par laquelle les parties s'échappent de l'abdomen." Richerand, Nosographie Chirurg. t. iii. p. 405. edit. 2.

† Scarpa, Traité Pratique des Hernies, p. 38—43.

when performed in a proper manner, and in due time, does not prove the cause of death oftener, than perhaps once in fifty times, it would undoubtedly preserve the lives of many, to perform it almost as soon as the disease commenced, without increasing the danger, by spending much time in the use of means, which cannot be depended upon. *

Indeed, the necessity of the operation, as soon as some of the most efficacious, and least dilatory, plans of treatment, have been fairly tried, is indicated by daily experience. The intestine is often found in a state of mortification, a very few hours after its protrusion.

Hence, in selecting a method of treatment, previously to the operation, the surgeon should be actuated by a determination to lose no time. The loss of a single hour may launch the patient into a state, from which no subsequent skill can extricate him.

The taxis, or reduction of the hernial contents by the hand, ought to form the primary object of a surgeon called to an incarcerated hernia. To perform this well in bubonoceles is impossible, without an accurate knowledge of the precise situation of the abdominal ring; and of the direction of that canal, of which the ring is merely the external termination; and it has often been a matter of surprise to me, that many surgical authors, who have been tediously particular in relating the mode of performing the taxis, should never have reminded their readers of the great utility of attending carefully to the situation of the opening, through which the hernia protrudes. The projecting point of bone, termed the *angle of the pubes*, is the chief guide to the situation of the ring. The opening lies a little above, and on the inside of this bony prominence, which is very distinguishable in the fattest subject.

The contents of an ordinary bubonocele descend through the canal of the abdominal ring downward and inward, or, more correctly speaking, in the direction of a line drawn from the ilium to the angle of the pubes; the sac, invested by a certain fascia and the cremaster muscle, lying beneath the integuments, in front of the spermatic cord. In attempting reduction with the hand, therefore, all our pressure should be concentrated in the direction upward and outward, so as to press the contents of the hernia in the direction of the axis of the canal of that opening, out of which they protrude. The external oblique muscle should be relaxed. For this purpose, the thorax should be elevated, and turned towards the opposite side. Since, also, the femoral fascia, when tense, tightens Poupart's ligament, and an aponeurosis which is spread over the hernia, the thigh should be bent, and rotated inward.

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* "Cette opération par elle-même n'est pas si effrayante, ni si dangereuse que le vulgaire le croit; et sa fin assez souvent malheureuse, vient ordinairement parce qu'on la fait trop tard, lorsque le malade est dèja en danger de mourir par la seule inflammation, ou par la gangrene des intestins et des parties voisines." Bertrandi, Traité des Opérations de Chirurgie, p. 21.

In the femoral hernia, the viscera descend first downward and then forward, and the pressure should therefore be made first backward and then upward. Indeed, as the tumour mounts over the edge of the falciform process of the fascia lata, it should first be pushed a little downwards. * The external oblique muscle should be relaxed, and the thigh bent, as in the case of bubonocele. As Gimbernat and Mr. Hey have noticed, the stricture in the femoral hernia is not made, as was supposed, by Poupart's ligament, but frequently by a band of ligamentous fibres, more deeply situated. But, as this band is connected with Poupart's ligament, the relaxation of the latter must necessarily relax the former part.

No violence should ever be employed in attempting to reduce a hernia with the hand. Force can never do good, and may do immense injury to the inflamed viscera in the hernial sac. J. L. Petit†, and Sir Astley Cooper ‡, mention examples, in which the intestine was even burst by it.

Some writers have maintained, that when the rupture becomes painful, we are no longer justified in persevering in attempts at reduction by the hand. Certainly, it must be admitted, that all unnecessary and protracted handling of an inflamed hernial tumour ought to be condemned, as tending to increase the inflammation, and accelerate the approach of gangrene. However, were we always to omit a trial of the taxis, because inflammation of the parts had come on, I believe, that there would often be a necessity for having recourse to the knife, when the taxis, either alone or assisted by other means, would answer every purpose.

I have reduced ruptures with my hand, when they have been in a very painful state, attended with every sympton of strangulation.

When manual attempts at reduction have failed, other auxiliary means should be immediately tried. In the opinion of the most experienced men, bleeding, cathartics, clysters, cold topical applications, the warm bath, and tobacco smoke, or decoction, introduced into the large intestines, are the most efficacious. Yet it is not enough to possess this information; for, to render our knowledge likely to be productive of a judicious practice, it behoves us to learn precisely what degree of reliance should be placed upon each of these means, and the exact order in which they ought to be tried, so as to procure the greatest chance of relief, without occasioning any hazardous delay, beyond that critical moment, at which the operation is most strongly indicated.

When reduction by the hand proves impracticable, I am inclined to think venesection should be immediately practised. The testimony of the best writers is in favour of this plan; and the little time consumed in trying its effect, is another weighty circumstance in its recommendation. It is advisable on the principle of its

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* See Hey's Practical Obs. in Surgery, p. 150. edit. 3.

† Supplement au Traité de J. L. Petit sur les Maladies Chir. p. 113.

‡ On Inguinal and Congenital Hernia, p. 3.

counteracting inflammation, and of producing a temporary weakness and even syncope, with a general relaxation, highly favourable to the success of the taxis.

A strangulated hernia is to be regarded as a disease, accompanied with a considerable tendency to inflammation: the impeded functions of the intestinal canal may, and do certainly, produce an alarming disorder of the constitution; but, I cannot help considering the advanced progress of the inflammation in the contents of the hernia, as having a chief share in producing death, the degree of danger being in some degree proportioned to the state of the protruded viscera. Mr. Wilmer's idea, that bleeding renders the subsequent operation more dangerous, is most ably refuted by Mr. Hey. Bleeding is not, however, to be looked upon as capable of preventing the effects of such inflammation altogether, but only of retarding the progress, which they will still make as long as the cause of the inflammation, the strangulation of the viscera, continues.

Sometimes, in very old and feeble subjects, the use of the lancet may be judiciously omitted. In herniæ, attended with mere obstruction, from accumulation of the contents of the bowels in the protruded viscera, and not from strangulation, bleeding is also unnecessary.

Mr. Alanson thought, that bleeding never promoted the success of the taxis. However, this opinion is contrary to those of Le Dran, Pott, Richter, Callisen, Sabatier, Flajani, and of numerous other experienced surgeons.

In performing the operation, a large opening should be made in the vein, in order that the sudden evacuation of the blood may make the patient faint; for, the taxis is observed to be particularly successful during a swoon. For the same reason, a liberal quantity of blood should be taken away.

Having bled the patient, it becomes advisable to make another attempt to reduce the parts by the hand; and if fainting should occur, this favourable opportunity ought not to be lost.

Too often, however, the hernial contents are not to be released from their incarcerated state by such mild treatment.

I calculate, that a quarter of an hour would be amply sufficient for putting in practice the attempts at reduction by the hand, and bleeding.

Success not being obtained, I would next recommend the warm bath, if one could be speedily provided. But, though I have reduced several herniæ, while patients have been in the bath, and though I place considerable reliance in its efficacy, so perilous does delay appear to me in these circumstances, that should any great length of time be unavoidably necessary to prepare it, I would recommend it either to be dispensed with entirely, or to be prepared during the trial of other means.

In case a warm bath cannot speedily be prepared, let not the surgeon tamper with a disease so urgent in its nature, so rapid in its progress, and so often fatal from the inert and timorous conduct of the practitioner. Let him not, at all events, consume any material time in trying the effect of clysters and cathartics. The utility of the latter, in cases of enterocele, may be very rationally questioned. Every one, however, will admit, that, in cases of inflamed epiplocele, they ought to be administered.

In every instance, in which there is reason to believe the strangulated hernia to be of the intestinal kind, no sooner have the repeated attempts at reduction with the hand, assisted by bleeding, and the warm bath, failed, than the surgeon should immediately try the united effect of cold, applied to the tumour, and of a tobacco clyster, or its fumes, introduced into the large intestines. Snow, or ice pounded, and mixed with salt, and put into bladders, should be applied to the swelling. If snow or ice cannot be obtained, the evaporation of cold spirituous lotions from the surface of the swelling may be tried as a substitute.

In preparing the tobacco clyster, it is wrong to lose half an hour in infusing the plant. A drachm of it may be macerated ten minutes in a pint of boiling water, and the liquor then strained for use. One half should be first injected, and soon afterwards the other, unless the effects of the first quantity appear too violent.

Frequently, during the combined action of the ice and tobacco, the contents of the hernia return spontaneously into the abdomen; but, when this is not the case, the surgeon should make another final effort to reduce the parts by the hand. If this again fails, even when the patient is duly under the influence of the tobacco, and if the symptoms of strangulation, at the same time, continue to increase, the operation ought to be undertaken, without further delay.

OF HERNIÆ WITH OBSTRUCTION, BUT NOT STRANGULATION.

What the French surgeons call "*engouement*," is produced by the accumulation of the intestinal matter in the protruded portion of the bowels. It is most common in old large herniæ, and depends upon the difficulty, with which the contents of the intestines ascend against their gravity, so as to pass from the bowels, contained in the hernia, into the rest of the intestinal canal. They lodge in the part; the canal becomes obstructed; the intestinal contents accumulate, in larger and larger quantities, between the stomach and the seat of the obstruction; and the hernial tumour enlarges, being at first indolent and soft, and not elastic and painful, as in a true case of strangulation. The *engouement*, or simple obstruction of a hernia, is essentially different from incarceration, or strangulation, inasmuch as it may exist, without there being any disproportion between the opening, through which the hernia takes place, and the protruded parts. At length, the abdomen becomes tense; the tumour grows larger and painful; the patient, who had only been troubled with nausea, now vomits up the contents of the bowels; fever commences; and the general symptoms of strangulation occur, in combination with such as originate from the mere obstruction. This latter state, unattended with actual strangulation, may exist several days, and even weeks, without putting a period to life; while on the contrary, the bowels, when strangulated, immediately inflame, and sometimes become gangrenous in the course of four-and-twenty hours.

According to the French surgeons, bleeding is seldom of any use in hernia, accompanied with mere obstruction. Cold applications to the swelling, brisk cathartics, and laxative clysters, are the best means.

Attempts at reduction may be frequently repeated. The disease is very different from a hernia with strangulation; and examples have occurred, in which the obstruction has been got rid of, as late as eight, ten, or eleven days after its commencement. However, if the patient were aged and infirm, Richerand thinks that we ought not to let him fall a victim to abstinence and suffering, protracted thus long; but attempt his relief by an operation.* According to my own judgment, the surgeon should never have recourse to an operation in herniæ of this description, without having given active purgatives and the tobacco clyster, the fairest trial.

BUBONOCELE, OR INGUINAL HERNIA.

Of all the various species of hernia, the inguinal is by far the most common. In the unincarcerated and reducible state, it is denoted by the following circumstances:

First, By a tumour arising from a protrusion of some part of the bowel through that canal or opening which is commonly called the abdominal ring, and which in the male subject gives passage to the spermatic cord; and in the female, to the round ligament of the uterus. The swelling is not preceded by any symptoms of inflammation; and, though its commencement is generally slow and gradual, it frequently undergoes a sudden enlargement, and is, for the first time, particularly noticed by the patient himself, after he has been making some violent effort.

Secondly, By the diminution, or even total disappearance of the swelling, when the patient lies upon his back; by its recurrence, when he stands up again; and by the impulse, which is felt in the swelling, whenever he coughs.

About an inch and a half from the pubes, the strongest and thickest part of the tendon of the external oblique muscle splits into two fasciculi. The upper fasciculus, which is broader than the lower, is inserted into the edge of the angle of the pubes, where it seems to intermix with the fibres of the corresponding part of the opposite side, and with the ligamentous substance, uniting the ossa pubis. The lower, which is narrower, but stronger and more elastic, is inserted by means of a strong tendon, into the spine and crista of the pubes.

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* Nosogr. Chir. t. iii. p. 375, &c. ed. 2.

By the separation of these tendinous fasciculi, the abdominal ring is produced, which is rather of a triangular shape, the os pubis forming the base of the triangle; the two fasciculi, or, as they are termed, *pillars*, its sides; while the apex is the part at which they separate from each other. It is not, however, pointed, since some transverse fibres, which connect the two pillars together, round off its upper part.[*]

The aponeurosis of the external oblique muscle is covered, for a certain extent above the femoral arch, and the abdominal ring, by a very delicate expansion of the aponeurosis of the tensor fascie latæ. A portion of this thin aponeurotic layer extends beyond the ring, over the cremaster muscle, which it accompanies even into the scrotum, and is there lost in the cellular substance which connects the external surface of this muscle to what anatomists have called the dartos. The other portion extends towards the ilium. This tendinous expansion is intimately adherent to the edge of the femoral arch, and to the circumference of the abdominal ring, whereby it must tend to resist protrusions through either of these openings.[*] The internal oblique muscle is closely attached to the inner edge of the crista of the ilium, the anterior superior spine of the same bone, and to the origin of Poupart's ligament. Its inferior fibres, instead of pursuing an oblique direction, from above downwards, become transverse, and extend in fleshy fasciculi over the external angle of the ring. Its aponeurosis, says Scarpa, goes in front of the rectus muscle, and terminates in the linea alba. Its inferior attachment is to the spine of the pubes, immediately behind the insertion of the tendinous pillars of the ring. The lower muscular fibres, about eight lines from the external angle of the ring, open to form a passage for the spermatic cord, splitting into two fleshy portions; one external; the other internal. The external is attached, for a certain extent, to Poupart's ligament, and constitutes the principal origin of the cremaster muscle, the fibres of which cover the spermatic vessels, and accompany them into the scrotum, terminating in a species of aponeurotic muscular sheath, which includes the spermatic cord, with its cellular covering, and the tunica vaginalis testis.[‡]

The transverse muscle, situated under the internal oblique, is attached to the inner edge of the crista, and to the anterior superior spine, of the os ilium. Its fleshy fibres neither extend so low, nor so near Poupart's ligament, as those of the internal oblique; nor do its lowest fibres undergo any change of direction, since they form no outlet for any thing. The spermatic cord passes through the inferior fibres of the internal oblique, which separate to afford a passage for it; but it only glides under the lower fleshy edge of the transverse muscle. *The exact point, where it clears the latter muscle, is about an inch nearer the ilium, than where it pierces the internal oblique,* and where, as Scarpa has related, the chief origin of the cremaster is situated. The aponeurosis of the transverse muscle passes in front of the rectus, to be inserted into the linea alba; and below the abdominal ring it is implanted into the pubes; behind the attachment of the aponeurosis of the external oblique.*

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[*] See Lawrence on Ruptures, p. 177.

[†] Scarpa, Traité Pratique des Hernies, p. 22.

[‡] Ibid. pp. 23, 24.

On the side towards the peritoneum, the abdominal ring is shut up by the aponeurosis of the internal oblique and transverse muscles; which aponeurosis, though much weaker, than that of the external oblique, hinders any direct protrusion of the bowels into the ring. The passage of the spermatic cord, through the three layers of abdominal muscles, is not directly from behind forwards, in the direction from the sacrum to the pubes, but *it takes place very obliquely,* and in a line drawn from the ilium to the pubes. It is obvious, then, that *what is commonly named the abdominal ring, is rather a canal, the internal or deepest extremity of which corresponds to the point where the spermatic cord passes under the margin of the transverse muscle, while its external, or superficial termination is the abdominal ring, strictly so called.* The spermatic cord crosses the abdominal muscles, one after the other, and in three different places, which do not lie directly from behind forwards. *The point where the cord runs under the inferior margin of the transverse muscle is the furthest from the pubes, or about three inches from it. That, where the cord passes through the lower fleshy fibres of the internal oblique, or between these fibres and the principal origin of the cremaster, is an inch from the preceding point. Lastly, the place where the cord passes out of the abdominal ring is only an inch from the pubes, and almost immediately under the integuments of the groin.* Thus, we see, that *the abdominal ring,* taken in the sense of the whole of the opening for the transmission of the spermatic cord from the flank to the pubes, *is a true canal, about three inches in length, formed in front by the aponeurosis of the external oblique muscle, and behind by the separation of the lower fleshy fibres of the internal oblique, by the lower edge of the transverse muscle, and by the aponeurosis of these two latter muscles,* which descending lower than the abdominal ring, and being inserted into the pubes, hinder all direct communication between the ring and the cavity of the abdomen.†

In the situation of Poupart's ligament, and in the track of the spermatic cord previously to its exit from the ring, the peritoneum is protected by no very firm part, except the aponeurosis of the external oblique muscle; for little stress can be laid upon those of the internal oblique and transverse muscles, which are here very delicate.‡

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* Scarpa, Traité Pratique des Hernies, p. 25.
† Ibid. pp. 26—28.
‡ Ibid. pp. 31, 32.

The peritoneum is united to the muscles and aponeurosis of the abdomen by a very supple, extensible, cellular substance, which, without any laceration, allows the former membrane to become displaced.

The loose cellular substance, which envelopes the spermatic vessels behind the peritoneum, passes, along with them, under the fleshy margin of the transverse muscle, and through the separation of the lower fibres of the internal oblique; in short, it accompanies these vessels through the whole extent of the inguinal canal, and into the scrotum, as far as the point, where they enter the testicle. This cellular covering is a continuation of the similar texture, which is found every where upon the external surface of the peritoneum. As it approaches the ring, it becomes more and more voluminous; and, as soon as it is on the outside of this aperture, it is enclosed with the spermatic vessels and tunica vaginalis of the testicle, in the muscular and aponeurotic sheath of the cremaster, which extends to the bottom of the scrotum.*

The epigastric artery runs near the external side of the abdominal ring. It arises from the external iliac artery, a little way from the crural arch, and about an inch below the convexity of the great bag of the peritoneum. The space between this convexity of the peritoneum and the origin of the artery, is filled up by a good deal of cellular membrane, which is continued over the spermatic cord and the femoral vessels. The epigastric artery, originating sometimes from the inside, and sometimes from the front part of the external iliac, by forming with the latter vessel a more or less acute angle, conceals itself almost immediately under Poupart's ligament, and the aponeurosis of the internal oblique and transverse muscles. Thence, passing over the convexity of the peritoneum, it ascends obliquely towards the rectus muscle. In its course near Poupart's ligament, it is crossed by the spermatic cord.†

The exact point where an inguinal hernia usually begins, is that which corresponds, in the fœtus, to the communication of the tunica vaginalis with the peritoneum, and, in the adult, to the passage of the spermatic cord under the transverse muscle. According to Sir Astley Cooper, it is about an inch and a half from the external orifice of the abdominal ring; according to Scarpa, about three inches from the pubes. In the healthy state, says the latter anatomist, the peritoneum here presents a small depression, the depth of which increases in proportion as the spermatic cord is drawn further downwards. *It is this little bag, this kind of digital appendix, which, by its progressive developement, constitutes the hernial sac.* Lying upon the front of the spermatic cord, it first makes its appearance under the lower margin of the transverse muscle; thence it extends itself into the separation between the lower fleshy fibres of the internal oblique, invariably following the spermatic cord, on the front of which it is situated; and after having thus traversed all the inguinal canal, it finally protrudes at the abdominal ring. In all this course, the hernial sac, as well as the spermatic cord, is situated above the crural arch, the direction of which it follows; and the canal, which it passes through, is of a conical shape, the apex of which is towards the ilium, and the base at the external orifice of the ring.*

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* Scarpa, p. 34.

† Id. p. 36.

In old herniæ, however, things are somewhat different; and, as Sir Astley Cooper † first explained the internal opening of the passage, through which the parts protrude, becomes situated more directly behind the abdominal ring.

The hernial sac always adheres closely to the spermatic cord through its whole track, from the internal orifice of the inguinal canal to the bottom of the scrotum. At the place where the spermatic cord and hernial sac, joined together, pass through the separation in the lower fibres of the internal oblique muscle, the cremaster muscle is seen going to their external side, and accompanying them beyond the ring, where it is converted into a muscular and aponeurotic sheath, which, embracing the hernial sac, the spermatic cord, and the tunica vaginalis, proceeds with these parts to the bottom of the scrotum. The hernia never descends beyond the point where the spermatic vessels enter the testis, because there the cellular substance of the cord terminates. ‡

In old large scrotal herniæ, the cremaster muscle acquires a thickness truly surprising; its fibres, which are naturally very thin, becoming from four to six times more bulky. Where they are spread over the neck and body of the hernial sac, they sometimes present a remarkable firmness, and a yellowish colour. In old scrotal ruptures, it is not uncommon to find the fibres of this muscle intimately adherent to the edges of the abdominal ring; so that a probe cannot be passed between them without much difficulty; while, in recent herniæ, a probe will pass as easily between the edges of the ring and the cremaster as between this muscle and the hernial sac. In most cases, the apparent thickening of the hernial sac is not owing to such change in the protruded peritoneum itself, but to a thickening in the tendinous expansion derived from the fascia lata, together with a similar alteration of the cremaster, and of the cellular substance immediately on the outside of the sac. Thus, according to Scarpa, in an inguinal hernia, we have directly under the common integuments, an aponeurosis derived from the fascia lata; under this the cremaster; below this muscle the cellular substance on the outside of the sac; and, then, the sac itself. This author makes no mention of the fascia, which Sir Astley Cooper describes as being sent off from the external oblique muscle. No doubt, therefore, the aponeurosis, stated by Scarpa to proceed from the fascia lata over the cremaster and hernial sac, is the same thing as what Sir A. Cooper describes as being sent off from the tendon of the external oblique muscle.

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* Scarpa, pp. 44, 45.

† On Inguinal and Congenital Hernia, fol. Lond. 1804.

‡ Scarpa, pp. 46, 47.

The displacement of the epigastric artery in the greater number of inguinal herniæ is another subject of importance. The situation and direction of this vessel, which naturally runs about ten lines from the abdominal ring, are so altered, that it passes across the back of the neck of the hernial sac *, and is pushed from the outer to the inner side of that opening. In order to comprehend the cause of this displacement, we must recollect that the hernia begins at the very point where the spermatic cord emerges from under the lower margin of the transverse muscle, and that this place is rather nearer the ilium, than the point where the epigastric artery begins its course towards the rectus muscle. In its progressive increase, the hernial sac constantly follows the same track as the spermatic cord, on the front of which it lies. The cord crosses the epigastric artery: the hernial sac then, before leaving the canal of the ring, must necessarily pass with the cord over that vessel. At the same time, the internal orifice of the hernia enlarging, and the canal of the ring becoming shorter, by the approximation of its two openings, it follows, that, at the period when the hernia begins to appear in the groin, the epigastric artery is of course situated behind the neck of the hernial sac, being displaced from the outer to the inner side of the ring. In a vast number of dissections, Scarpa has met with very few instances of inguinal hernia, in which the epigastric artery was not thus displaced; and, in these exceptions, the weakness of the parietes of the abdomen, between the ilium and pubes, was very remarkable, and, in all the cases, the viscera had protruded through the aponeuroses of the transverse and internal oblique muscle; not towards the ilium, as usually happens, but a little way from the pubes, giving to the upper pillar of the ring an extraordinary curvature, disproportioned to the small size of the hernia. In short, in these individuals, the little digital process of peritoneum, constituting the origin of the hernial sac, had not begun to form under the margin of the transverse muscle, at the place where the spermatic cord goes under it, but it had pierced the aponeuroses of the internal oblique and transverse muscles, a little way from the pubes, within the point where the spermatic cord crosses the epigastric artery.†

To this case, Hesselbach assigns the name of *internal* inguinal hernia, while the more common form of the disease he calls *external.*‡ The *internal*, while small, is attended with a particular rotundity; it pushes up in a remarkable manner the upper pillar of the ring; it forms a much more considerable elevation about this opening, than an external inguinal hernia of the same size; it does not occasion any cylindrical elevation in the fold of the groin; when reduced, no guggling noise is heard; and the spermatic cord always lies on its outside. But when the hernia is large, these signs, as Scarpa observes, no longer serve for discrimination.

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* Scarpa, tab. ii. fig. 4, 5, 6., and tab. iii. pp. 4. 6. 8. Camper, Icones Hern. tab. x. P. H. tab. xii. M.

† Scarpa, pp. 68. 71.

‡ Anatomisch-Chirurg. Abhandlung über den Ursprung der Leistenbrüch. Wurzburg, 1806.

Though, in the *external* inguinal hernia, the hernial sac commonly lies upon the spermatic cord, it should be remembered, that instances are recorded, in which the vas deferens and spermatic vessels have been situated in front of the sac*, as well as other examples, in which the hernia was interposed in various ways between the parts composing the cord. † These changes are chiefly observed in herniæ of large size. The vessels of the cord, however, are generally but little separated from each other towards the ring, but diverge more and more as they proceed downward. A similar alteration in the position of the vessels of the cord is noticed in large hydroceles.

I have known surgeons disagree whether certain cases were inguinal or crural herniæ; and occasionally the error on one side was not dispelled, till a confused operation, or the death of the patient, had thrown light upon the disease. Practitioners may the more easily fall into such mistakes, in consequence of inguinal herniæ being always expected in men, and never in women ‡; while crural ruptures are regarded as a common affliction of females, but a most unfrequent one of males. Deviations, however, from what is ordinary are possible, and should ever be in the recollection of a consummate surgeon. In men, a crural hernia may acquire a very large size, ascend above Poupart's ligament, and project over the abdominal ring. The swelling has then a roundish form, and may resemble an inguinal hernia, that contains only intestine, that is gradual in its increase, and that has not yet descended into the scrotum.

I shall not insist on the likelihood of the mistake being discovered, by the impossibility of reducing such a hernia by pressure, directed from below upwards and outwards, in the oblique course of the canal within the abdominal ring. As will be hereafter related, the femoral hernia only admits of reduction by being pushed first from above downwards, and then perpendicularly with respect to the groin. The relation, which the neck of the tumour bears to the crural arch, will enable the practitioner to distinguish the nature of the cases. When a crural hernia is drawn downwards, the crural arch can be traced extending over the neck of the sac; while, in a bubonocele, it runs under that part. The spine of the pubes, which is behind and below the neck of the sac in an inguinal hernia, is on the same horizontal level, and rather within it, in the crural rupture.*

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* Le Dran, Traité des Operations, p. 127.; Schmucker, Vermischte Schriften, vol. ii. p. 55.; Sir A. Cooper on Inguinal and Congenital Hernia, p. 49.

† Hey's Practical Obs. in Surgery, p. 140. edit. 2.; Sir A. Cooper, op. cit. p. 9. and 10.; Camperi Icones Hern. tab. 8. et 15.

‡ Bubonoceles are occasionally, but not often, seen in women. Several, which were dissected by Cloquet, are related by him in his "Recherches sur les Causes et l'Anatomie des Hernies abdominales, 4to. Paris, 1819. See obs. 13. p. 32; and obs. 20. p. 44. This last case, which was on the left side, was remarkable, on account of the ligamentum rotundum uteri on the right side being accompanied with the diverticulum described by Nuck, which was an inch and a half in length. In the body of another female, aged about fifty, Cloquet found two external inguinal ruptures. See obs. 24. p. 48. Other examples of external inguinal ruptures in women are also recorded at p. 107. 132. 140, &c. and an internal inguinal hernia in the body of an aged female, p. 116. 143, &c.

A bubonocele in women always descends from the abdominal ring, in the direction of the round ligament of the uterus, and tends towards the labium; just as an inguinal hernia in man follows the course of the spermatic vessels, and falls towards the scrotum. On the contrary, the crural hernia may remain below, or rise over the crural arch; but, its direction is never towards either the labium, or the scrotum. †

Cirsocele, or a varicose enlargement of the spermatic veins, resembles in several respects a hernial tumour: when large, it dilates upon coughing; it is prominent in the erect posture; and it subsides when the patient lies down. The method of distinguishing the two complaints, consists in putting the patient in the horizontal position, and emptying the swelling by pressure upon the scrotum; the surgeon is then firmly to press upon the upper part of the abdominal ring, when, if the case be a hernia, the tumour cannot re-appear as long as the ring is compressed; but, if the disease be a cirsocele, the swelling returns with increased size, on account of the pressure interrupting the course of the blood through the spermatic veins. ‡

Hydrocele may be distinguished by the perfect equality of the whole tumour; its transparency when a candle is placed behind it; the smallness of the spermatic process; the absence of pain on handling the swelling; the fluctuation of the water; the gradual formation of the tumour; its having begun below, and proceeded upward; its not being affected by any posture or action of the patient, nor increased by his coughing; and, lastly, the absolute impossibility of feeling the testicle at the bottom of the scrotum.

Hernia humoralis, or an inflamed testicle, may be known by the hardened state of the epidydimis; the exemption of the spermatic cord from all unnatural fulness; the generally preceding gonorrhœa; the pain in the testicle and loins; the weight of the tumour; and the tense, reddish, smooth, shining, uncorrugated appearance of the scrotum.

An indurated gland may be distinguished from a hernia, by its being unconnected with the spermatic cord, and by its circumscribed, incompressible hardness; and when in a suppurated state, a fluctuation may be felt.

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* Lawrence, p. 593. edit. 3.

† Pelletan, Clinique Chirurgicale, tom. iii. p. 28.

‡ See Sir A. Cooper's Anatomy, and Surgical Treatment of Inguinal and Congenital Hernia.

The lodgment of the testicle at the abdominal ring may be mistaken for an incipient hernia; but, the absence of that organ in the scrotum, and the great sensibility of the tumour, are circumstances, by which an attentive practitioner may always avoid mistake.

Hæmatocele, or a collection of blood in the tunica vaginalis, is particularly apt to be confounded with a hernia, in consequence of its generally proceeding from a blow, and having the same shape as the last disease. But, according to Sir Astley Cooper, the firmness of the hæmatocele; the redness of skin accompanying it; its not dilating when the patient coughs; and the spermatic cord being free from swelling at the ring, will point out the difference of the complaint.

Cysts, filled with water, sometimes form in the course of the spermatic cord. When quite below the ring, they may be readily discriminated by their not being connected with the abdomen. When they reach within the ring, and have no distinct transparency, nor fluctuation, they should be opened with great circumspection. I have known an encysted hydrocele of the cord accompany the existence of an old hernial sac, be mistaken for a protrusion of the viscera, and on account of complaints, induced by a kick in the groin, operated upon, under the idea of the case being a strangulated hernia. When the cyst, the supposed hernial sac, was opened, the fluid which it contained, was discharged, and on introducing the finger, nothing was found but a circumscribed cavity. After a few more incisions, an opening was made into the real hernial sac, which was not suspected of being so, as no viscera protruded. Upon passing the finger upward, some fluid now escaped from the abdomen, and all seemed uncertainty, as to what the case actually was; nor did the doubts subside, till the parts were examined after death.

OPERATION FOR STRANGULATED BUBONOCELE.

The hair should first be removed from the tumour and adjacent parts. The incision is to commence about an inch above the ring, and, unless the tumour be large, is to extend nearly to the lowest part of it. In operating upon a scrotal hernia of middling size, it is of no importance, that the incision tend a little more towards one side of the swelling than the other. But, if the hernia be old, and of large size, the cut should be made exactly in a longitudinal line, that divides the tumour into two equal parts; for, in this degree of the disease, the component vessels of the spermatic cord are frequently separated from one another, and pushed over the sides, or even upon the very front of the lowest portion of the hernial sac. Therefore, by dividing the lateral and inferior part of the sac in such cases, the surgeon would run the risk of cutting the spermatic artery, either alone, or together with the vas deferens.*

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* Scarpa, Traité Pratique des Hernies, p. 100.

The incision through the skin and cellular substance covering the sac, divides the external pudic branch of the femoral artery, which crosses the hernial sac near the abdominal ring, and sometimes bleeds so freely, as to require a ligature. It also exposes the fascia *, which, according to Sir A. Cooper, passes from the external oblique muscle, and covers the cremaster. By beginning the cut above the ring, we gain room where it is much needed, in a subsequent part of the operation, viz. the incision of the stricture. †

With a pair of dissecting forceps, a portion of the fascia must next be raised, and a small opening made in it, sufficient for the introduction of a director, on which instrument the surgeon is to divide the fascia upward to the abdominal ring, and downward to the end of the first wound.

This division of the fascia exposes the cremaster muscle, which is to be opened precisely in the same manner; when the cellular substance immediately covering the peritoneum, or true hernial sac, will present itself. These investments, as I have already related, are generally much thicker than the sac itself, which, excepting when the hernia has been often inflamed, or adhesions exist, mostly retains its natural thinness and transparency. ‡

The operator is now to take hold of some of this cellular substance, which adheres intimately to the anterior inferior part of the sac, with a pair of dissecting forceps, and thus he is to raise the sac itself. Then, with the edge of the knife turned horizontally, he is to make an opening just large enough to admit the blunt end of a probe, or director; upon which the sac is to be further divided upward to the abdominal ring, and downward to the bottom of the tumour. The anterior and inferior part of the sac is selected as the place for making the first opening, because the intestine seldom descends so low; and whenever fluid is present, it gravitates to this situation. Sir Astley Cooper does not extend the division of the sac nearer to the ring than an inch, in order to avoid making the closure of the wound more difficult, and to lessen the danger of peritoneal inflammation.

The next object is the division of the stricture. Sir Astley Cooper directs the surgeon first to introduce his finger into the neck of the hernial sac, for the purpose of ascertaining the exact situation of the strangulation, which he will find either at the abdominal ring, or about one inch and a half from this aperture, in the direction upward and outward; or, lastly, in the mouth of the hernial sac.

When the stricture is produced by the abdominal ring, the above gentleman recommends the surgeon to pass his finger into the sac, as far as the stricture, and then to convey a probe-pointed

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* This tendinous expansion, as the reader already knows, is described by Professor Scarpa as a continuation of the fascia lata.

† Lawrence on Ruptures, p.212. edit. 3.

‡ Scarpa, p.104.

bistoury, over the front part of the sac, into the ring, which is next to be divided, upward, opposite the middle of the neck of the sac, and to an extent just sufficient to allow the protruded parts to be returned into the abdomen, without injury.

The chief advantages of dividing the ring upward, depend, first, on the fabric of this aperture not being so much weakened as it would be by cutting upward and outward, and dividing the transverse tendinous fibres, which cross its upper part; and, secondly, on the safety of the method in regard to the epigastric artery, whether the case be the external, or internal hernia, of Hesselbach, in which last example the artery always lies on the outer side of the neck of the sac. If, however, we were sure of the disease being the less common disease, an internal inguinal hernia, of course, it would then be perfectly safe to cut the ring inwards and upwards.

However, a frequent situation of the stricture is not at the abdominal ring, but at the place where the sac opens into the abdomen; that is, an inch and a half, or two inches towards the anterior superior spinous process of the ilium from the ring. Here the strangulation is caused by the transversalis muscle and its tendon, which pass over the hernial sac, in a semicircular direction, and by a fascia arising from Poupart's ligament, the semicircular border of which passes under the sac. In this case Sir Astley Cooper advises the surgeon to introduce his finger into the sac, through the abdominal ring, as far as the stricture; and then the probe-pointed bistoury, with the flat part of its blade turned towards the finger, is to be insinuated between the front of the sac and the abdominal ring, till it arrives under the stricture, formed by the lower edge of the transversalis and obliquus internus. The edge of the instrument is to be next turned forward, and the stricture cut in the direction upward; by which method the epigastric artery cannot be cut, whatever be its situation in regard to the sac. The division should only be of sufficient extent to allow the finger to pass through the strangulation, and Sir A. Cooper makes it with a bistoury, the cutting edge of which extends but a little way from the point.

When the stricture is caused by the neck of the sac itself, the probe-pointed bistoury must be carefully introduced, and a division made directly upward.

The above plan of passing the bistoury between the sac and ring, is now generally rejected, and the preference given to introducing the instrument within the neck of the sac itself, for the division of the stricture.

Having removed the stricture, the next object is to return the protruded parts into the cavity of the abdomen. Nothing, but the absolutely gangrenous state of the intestine should deter the practitioner from reducing it; the dark chocolate brown discolorations, with which it is often affected, generally produce no permanent mischief, and ought to be discriminated from the black, purple, or lead-coloured spots, which are the ordinary fore-runners of mortification. The intestine is to be reduced before the omentum; and the portion nearest the ring should be first introduced.

After the operation, it is a point of great importance to ascertain with the finger, that the parts are all fairly and freely reduced into the abdomen. Recent adhesions of the intestines to the inside of the sac may be easily broken by the fingers. When the adhesions are old, the cautious employment of the knife is necessary; if they are sufficiently long to allow the intestine to be raised a little from the sac, they may be easily divided. The intestine and omentum remain destitute of their peritoneal covering at the points, where such membranous adhesions were situated; but experience proves, that, after the reduction of the parts, no harm results from the circumstance, and the cure is not even retarded by it.* When they are so short, that the inside of the sac and peritoneal coat of the intestines are in close contact, more skill is requisite, and the adherent parts of the sac must be cut off and returned into the abdomen, still adhering to the bowels. It is but right to state, however, that this practice is disapproved of by Scarpa; first, because this sort of adhesion, between the intestine and the sac, is most frequently situated in the neck of the latter part, where the object could not be effected without the greatest risk of wounding the spermatic cord; and, secondly, because the outer surface of the bowel would present in the situation of the adhesion of a bleeding surface, that could not be safely reduced. Scarpa, therefore, recommends us merely to remove the stricture, and not attempt to destroy such adhesions. †

When the adhesions are between the omentum, on one part, and the hernial sac or bowel, on the other, Scarpa approves of Pott's ‡ method, which consisted in dividing the omentum, as close as possible to the adhesion.

As soon as the intestine has been reduced, the omentum, if not diseased, is next to be replaced. However, when it is much indurated or thickened, a portion of it may be cut off. If any small arteries bleed, they are to be tied with a fine ligature. The practice of tying the whole omentum ought to be reprobated in the strongest terms. As Sir Astley Cooper judiciously remarks, it is extraordinary, that this custom should ever have prevailed. The very object of the operation is to remove from the omentum the stricture, derived from the pressure of a surrounding tendon; and no sooner is this done, than the surgeon applies a ligature, which produces a more perfect constriction, than that which existed before the operation was undertaken.

When a portion of the omentum is mortified, and adhesions within the ring do not render the scheme impracticable, or unadvisable, the dead part is to be cut off, and the rest returned. This membrane is sometimes found converted into a large indolent fleshy mass, weighing two or three pounds. Here it should be cut away, and the bleeding vessels tied with fine silk ligatures.

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* Scarpa, p.158.

† Op. cit. p.161.

‡ Chir. Works, vol. iii. p. 299.

In cases of large, old, adherent herniæ, it is best to remove the stricture, without laying open the hernial sac, or at most, only the neck of it. The separation of the preternatural connections is often extremely tedious and difficult. As Mr. Lawrence observes, the violence which must necessarily be inflicted, in executing this part of the operation, would be very apt to make the parts inflame. The extensive surface, which must be exposed by laying open the whole of a large hernial tumour; the risk of cutting the spermatic vessels, which often lie in these cases on the front of the lower part of the sac; the occasional impossibility of keeping the returned part in the abdomen; the great dilatation of the ring, and the little hope of a radical cure; present numerous reasons in favour of the plan of only dividing the stricture. An incision, two or three inches long, is to be made in the integuments over the abdominal ring. The fascia, covering the sac, is to be exposed, and opened. A director may now be passed under the tendon, and a probe-pointed bistoury conducted along the groove to the part which is to be cut. In case of difficulty, the neck of the sac may be opened, and then the director introduced, &c.*

MORTIFICATION OF THE INTESTINE.

The swelling, which was before tense and elastic, now becomes soft, doughy, emphysematous, and of a purple colour. Sometimes the parts now return spontaneously into the abdomen, and the patient survives only a few hours. In other cases, as Sir Astley Cooper has explained, the skin over the tumour sloughs, the intestine gives way, and the feces being discharged at the wound, the symptoms of strangulation soon cease. In this circumstance, the intestine becomes adherent to the hernial sac, the sloughs are thrown off, and thus an artificial anus is established, through which the feces are sometimes discharged during the remainder of life. Though such is the course of many of these unfortunate cases, it frequently happens, that the feces resume their former course to the rectum, and the artificial anus becomes unnecessary, and closes. I have seen several cases of this kind in St. Bartholomew's Hospital.

The degree of danger, which attends an artificial anus, depends upon the vicinity of the sphacelated intestine to the stomach; for, if the opening be in the jejunum, so little space is left for the absorption of chyle, that the patient dies of inanition.

If only a small slough has taken place, the intestine is to be reduced, without any particular proceeding. Some writers recommend introducing a ligature through the mesentery, in order to confine the mortified part of the bowel near the wound. This proceeding, however, is quite unnecessary, as the disordered part of its intestine never leaves the neighbourhood of the abdominal ring, being kept in this situation by the adhesions of the adjacent parts to each other, in consequence of inflammation.

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* See A. Cooper on Inguinal and Congenital Hernia, pp. 45, 46.; and Lawrence on Ruptures, p. 269. edit. 4.

Even were the mortified part of the bowel not exactly opposite the ring, there would be no reason to fear any effusion of its contents. It appears from the valuable observations of Petit*, that the contents of the bowels, and even blood, when extravasated in the abdomen, do not become widely diffused; but are first kept from spreading about by the pressure of the respiratory muscles, and afterwards by the inflammatory agglutination of the surrounding parts.

When the whole cylinder of the intestine is mortified, all the various proposals, mentioned in the chapter on wounds of the belly, have been recommended. One practice has been that of cutting away the sphacelated part of the bowel, and bringing the two ends together, and keeping them so, by means of four stitches, made with fine thread or silk, and a common sewing-needle. Then a thread is to be introduced through the mesentery, for the purpose of keeping the ends of the intestine opposite the mouth of the hernial sac.

Mr. Lawrence most properly objects to this kind of practice; because by drawing the intestine out of the cavity, in order to remove the dead part, the adhesion behind the ring, on which the prospect of a cure entirely depends, must be entirely destroyed; and new irritation and inflammation must be unavoidably produced by handling and sewing an inflamed part. La Peyronie tried the plan of removing the dead part, and passing a ligature through the mesentery, so as to draw this membrane into a fold, and bring the two ends of the bowel nearer together. These were then kept near the ring, by means of the ligature. La Peyronie's practice, however, ingenious as it may appear, has at present no advocates, and certainly, if it were only on account of the danger of its disturbing those salutary adhesions, which are formed between the living ends of the bowel and the adjacent parts, the practice ought to be condemned. Nor is Littre's treatment more to be commended, which consisted in retaining the superior extremity of the bowel in the wound, and tying the lower, so as to aim entirely at the establishment of a permanent artificial anus. †

They have generally been the best surgeons in these circumstances, who have been content with little interference. If we merely make an outlet for the contents of the mortified bowel, and wait quietly, the sloughs will be cast off; the ends of the gut will be fixed near each other by the adhesive inflammation; the wound will often gradually close up; and the function of the intestinal canal be in time more or less perfectly re-established.

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* Vid. two essays, sur les Epanchemens, in Mém. de l'Acad. Royale de Chirurgie, tom. ii. and iv. edit. 12mo.

† Mém. de l'Acad. des Sciences, an. 1700.

With regard to dividing the stricture, after the intestine has completely mortified, this measure is, in all probability, generally wrong, because it can now answer no rational purpose; and, besides giving unnecessary pain, must tend to disturb the completion of those salutary adhesions, by which the living part of the bowel is fixed to the wound. On this subject, I perfectly coincide with Mr. Travers. When the bowel is mortified, there is, in fact, no longer any stricture, the resistance which rendered it so having been taken off by the collapse of the included gut. * The incarceration has actually done its worst, and the parts acted upon by it being dead, are clearly susceptible of no further harm. Nor can the incision of the stricture now be necessary, on the ground that it will promote the evacuation of the intestinal contents, since, when the bowel has given way, before the operation, the sac and integuments are always loaded with fecal matter. † The propriety, however, of dividing the stricture, when the gangrenous mischief is but little advanced, is self-evident. When the intestine has mortified, but not burst, it is an important object always to make a free opening into it, so that the confined feces may have a ready outlet. The neglect of this practice, no doubt, has often deprived patients of all chance of recovery; for, while the contents of the bowels remain confined, no amendment in the symptoms can be expected.

When the gut has already given way, the propriety of facilitating the escape of the intestinal contents, by a free incision in the skin and sac, cannot be doubted. ‡

In the different stages of mortified hernia, mild purgatives, and clysters, nourishing broths, soups, jellies, &c. wine, bark, and cordials, may all be of essential service. Poultices and fomentations are the best applications, till the sloughs have separated.

Scarpa § published, a few years ago, some highly interesting remarks on the process employed by nature in repairing solutions of continuity in the intestinal canal, especially in cases of hernia, with gangrene. After noticing the manner in which the excrement is discharged in these cases through the artificial anus, he observes, that though it is undoubtedly a disgusting infirmity, it does not preclude all hope of a radical cure, not even when a considerable portion of the intestinal canal has been destroyed by sphacelus. The recorded examples of such cures are abundant; and yet, says Scarpa, nothing as hitherto been written, which will serve to convey

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* Travers on Injuries of the Intestines, &c. pp. 300, 301.

† Op. et loc. citato.

‡ See Pott's Works, vol. iii. case 21.; and Travers on Injuries of the Intestines, &c. p. 308, &c.

§ Sull' Ernie Memorie Anatomico-Chirurgiche. Folio. Milano. 1809.

an exact idea of the simple and admirable means which nature employs in accomplishing them. Surgeons have generally supposed, that, after the detachment of the dead parts, the two orifices of the bowel remain separated, and acquire adhesions to the margin of the external wound; that afterwards, in proportion as this contracts, they come gradually nearer together, and, in the end, touch each other so accurately, that the feces are capable of passing directly from the superior to the inferior portion of the gut. But this theory cannot satisfy those, who have attentively examined, in any cases of mortified hernia, the respective situations of the two orifices of the intestines, and their relation to the external wound. In fact, the two ends of the bowel are constantly found lying in a parallel manner, by the side of each other; the upper with its orifice open, and directed towards the external wound by the feces, which issue from it; the lower, on the contrary, as it gives passage to nothing, always with a tendency to become less capacious, and retracted into the cavity of the abdomen. The contraction of the external wound cannot have the least effect in changing the direction of these two orifices, nor, consequently, in applying them to each other. Even supposing there were some natural tendency to this approximation, the upper orifice being wider than natural, and directed outwards, could never accurately coalesce with the lower one, which is shrunk and retracted within the belly. The feces then could never pass from one into the other, without the effusion of a considerable part of them outwardly, and, in every instance, the result would be an incurable fistula, discharging the intestinal matter. Scarpa had an opportunity of examining the body of a young man, who, in consequence of eating a large quantity of indigestible food, died about ten months after having been operated upon for a congenital hernia, attended with mortification of the protruded bowels, at a period when he had recovered, with the exception of an occasional discharge of a very small quantity of feces from an inconsiderable fistulous opening. Scarpa also dissected two other cases; and, from all these, it appears that the breach in the intestinal canal is not repaired by the orifices of the upper and lower portions of the bowel re-uniting, coalescing, and running, as it were, into each other; nay, that the two openings meet at a very acute angle, and never lie laterally together. On the contrary, Scarpa's investigations satisfactorily prove, that a funnel-shaped membranous canal, (what he terms the *imbuto membranoso,*) composed of the remains of the hernial sac, constitutes the medium of communication between the upper and lower orifices of the bowel, which, in an early stage, becomes adherent to the peritoneum, about the neck of the hernial sac. The base of the funnel-shaped membranous cavity corresponds to the bowel, while its apex tends towards the wound, or fistula. It farther appears, that the feces, in order to get from the upper into the lower part of the bowel, have to pass through the funnel-shaped cavity in quite a semicircular track; and that, between the orifices of the bowel, directly opposite to the aperture between the cavity of the intestine, and that of the funnel-shaped membranous cavity, a considerable projection, or jutting angle, is formed, which makes a serious additional obstacle to the direct passage of the feces from the upper into the lower portion of the intestinal tube.*

FEMORAL OR CRURAL HERNIA

Often takes place in women who have had many children; seldom in young females; and still more rarely in men. In male subjects, the viscera generally escape through the abdominal ring, along the spermatic cord; in women, the protrusion is mostly below Poupart's ligament, on account of the smallness of the abdominal ring, its lower situation, its greater proximity to the pubes, and the more considerable extent of the crural arch in them, than in men. The crural hernia, whether in the male or female sex, forms in the cellular membrane, which accompanies the crural vessels under Poupart's ligament; it follows the inner edge of these vessels, and gradually descends to the bend of the thigh, between the sartorius, gracilis, and pectineus muscles. †

The tumour, in fact, takes place below Poupart's ligament, just on the inside of the femoral vein, and, being situated in front of the pectineus, is of course on the outside of the fascia lata. The variety, however, in which the hernia descends into the sheath of the crural vessels, is an exception to the latter statement. Many surgeons have imagined, that the hernial sac and the bowels usually lie over the crural vessels and trunk of the vena saphena, and sometimes betwixt these vessels and the anterior superior spine of the ilium: but as far as Scarpa's researches extend, this statement is not supported by a single accurate description of a crural hernia in the incipient state. It is true, however, that, when the tumour grows very large, and its fundus inclines parallel to the fold of the groin, it partly, or totally covers the crural vessels, and even the crural nerve; but the femoral hernia never begins with descending over the crural vessels, and is never situated, in its early stage, between those vessels and the anterior superior spine of the ilium. Nor does the hernial sac at any time change its place from the inner to the outer side of the same vessels.‡ The direction, in which the parts protrude, is first downwards and then upwards, so that, in attempting the taxis, the surgeon should endeavour to reduce the viscera first backwards, and then upwards and inwards towards the navel, the abdominal muscles, Poupart's ligament, and the fascia of the thigh, being relaxed in the same way, as when an attempt is made to reduce a bubonocele. Intestine is almost always contained in the sac; the cases in which the omentum protrudes by itself being unusual.

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* It is but justice to mention, that some of the preceding facts were well known long before Scarpa published; especially the positions of the two portions of bowel with respect to each other, the diminished size of the lower continuation of the tube, and the ridge or angle between them. See particularly the Obs. of M. Pipelet, "Sur la Réunion de l'Intestin, qui à souffert Déperdition de Substance, dans une Hernie avec gangrene." This author gives us an accurate drawing of the manner, in which the two parts of the bowel lie with regard to each other after the cure. (Mem. de l'Acad. Royale de Chir. t. xi. p. 258.)

† Scarpa, Traité des Hernies, p. 203.

‡ Id. p. 204.

The anatomical circumstances, most worthy of the surgeon's notice, will be described in the account of the operation. With respect to the diagnosis, the tumour is generally much smaller than a bubonocele, and lies so deeply in the groin, that, in the thinnest subjects, its neck cannot be plainly felt. When the hernia is large, its neck is always deep, while its body and fundus assume an oval shape, being their greatest diameter across the bend of the groin. But, whatever may be the size of a bubonocele, its shape is always pyramidal, the base, instead of tending towards the hip, constantly follows, in the male subject, the direction of the spermatic cord into the scrotum. Besides the symptoms common to hernia in general, the crural species, when it has attained a certain size, has some characters which are peculiar to it; as a sensation of stupor and heaviness in the thigh, and œdema of the leg and foot.* A femoral hernia, when small, is frequently mistaken for an enlarged gland; but though, in the latter case, the appearance and feel of the tumour may not be sufficient to convey positive information as to the disease being hernia, the general symptoms are those by which we should be guided; and if they be of an urgent but ambiguous nature, it is better, as Mr. Lawrence observes, to use the knife for getting the requisite knowledge, than leave the patient to die without any attempt to save him. Cutting down upon a swelled gland will not be dangerous; and, if the case be a strangulated hernia, it will be the only means of saving life. I have seen more than one case, in which the patient was lost, in consequence of the disease being mistaken for a bubo, and no operation performed.

The general treatment of the crural hernia resembles that of other ruptures.

In the operation for a strangulated femoral hernia, the incision through the integuments should commence from the point where the hernia protrudes; that is, at Poupart's ligament, a little nearer to the symphysis pubis, than the femoral vessels are; and it should be continued obliquely downwards and outwards.† Any glands, which may lie over the hernia, should be avoided. The sac is still concealed beneath cellular substance, which is here much thicker than in a bubonocele, and beneath aponeurotic fibres, which proceed from the femoral fascia, ascend obliquely over the front of the thigh, and are connected with the lower and external part of the tendon of the external oblique muscle. These fibres, which constitute what is frequently named the fascia propria, must be divided before the hernial sac can be exposed. The femoral hernia is on the outside of the fascia lata, except in a few instances, in which the parts enter the sheath of the femoral vessels. Hence, the operator should make his incisions cautiously; as the sac, which is usually very thin, lies immediately under the integuments, with the intervention of only a few tendinous fibres, which may be most safely divided, when a director, or probe, is placed under them.

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* Scarpa, p. 208.

† See Lawrence on Ruptures, p. 425. ed. 4.

The hernial sac is to be opened by means of a pair of dissecting forceps and a bistoury. The operator is to raise the part by taking hold of the cellular membrane attached to it, and is then to make a very small aperture by a superficial horizontal cut. Through this opening a director is to be introduced, and the surgeon may then safely divide the sac nearly as high as Poupart's ligament, and quite to the bottom of the tumour.

The next object is to divide the stricture. Formerly, the stricture was always supposed to be caused by the front edge of Poupart's ligament; and, consequently, its division was generally deemed the chief design of the operation. Le Dran, in operating for a crural hernia, very long ago observed, that the closest strangulation was not made by this ligament*; and when he divided the neck of the sac, no doubt he cut what Mr. Hey has since named the *femoral ligament*, the part generally producing the pressure on the strangulated viscera. Gimbernat is entitled to the honour of having first explained what part it is that really forms the strangulation.†

The lower border of the aponeurosis of the external oblique muscle, as Mr. Lawrence remarks, has a broad insertion into the pubes; this attachment, which begins at the spine, runs along the crista of the bone. Its position, therefore, in the erect state of the body, is nearly though not entirely horizontal; consequently, its two margins should be described by the epithets anterior and posterior; it being remembered, at the same time, that the former of these is rather higher, than the latter. That part of it, which is fixed to the spine of the bone, has the appearance of a firm, and somewhat round tendinous chord. Its insertion into the crista of the pubes is effected by means of a thinner portion, which gives to the tendon a clearly defined sharp edge at its posterior margin, and is more deeply situated, than the part attached to the spine of the bone.‡

It is this thinner, deep-seated, sharp-edged, posterior margin of Poupart's ligament, near the pubes, that occasions the strangulation in cases of femoral hernia, and requires to be divided in the operation. Hey terms it the *femoral* ligament. There is, however, another part, which has some share in producing the strangulation.

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* Observ. 57.

† See an Account of a new Method ofoperating for Femoral Hernia, by Antonio de Gimbernat. The original was first published at Madrid in 1793.

‡ On Ruptures, p. 387. edit. 4.

Where the attachment of the fascia lata to the crural arch terminates, it forms a *semilunar* * *fold*, with the concavity turned towards the pubes, or opposite limb. This fold bends under the crural arch, so as to unite to the femoral ligament at its commencement, and, consequently, it must contribute in some degree to the stricture.

Gimbernat has called the space beneath Poupart's ligament the *crural arch*. The anterior crural nerve always passes on the outside of the sheath for the femoral vessels, towards its external and posterior part. Before the external iliac artery enters, it sends off the epigastric. This vessel passes obliquely inward, between the crural arch and spermatic vessels. Immediately on the inside of the crural vein, there is a foramen, sufficiently distinct, almost round, at which many lymphatics enter. It is sometimes stopped up by a lymphatic gland; but the parts, which form the crural hernia, always pass through it, and consequently, Gimbernat calls it the *crural ring*. It is bounded above and in front by the posterior edge of Poupart's ligament, and the semilunar, or falciform process of the fascia lata; below and behind by the pubes; on the internal or mesial side by the thin border of the tendon; and on the outer lateral part by the crural vein. It is much smaller than might be imagined, since the large space under Poupart's ligament is elsewhere completely occupied, and also strengthened by an aponeurosis, which is derived from the iliac and psoas muscles, and extends from their surface to the crural arch, ending just over the crural vein. †

Having laid open the hernial sac, in the manner above recommended, the next object is the division of the stricture. Mr. Hey used to pass a director within the crural ring, on that side of the intestine, or omentum, which was nearest to the symphysis of the pubes, and with a probe-pointed bistoury cut that part of the ring, which he names the *femoral ligament*, directly upwards, a plan which answers very well in women, but would endanger the spermatic chord in men. Gimbernat recommends introducing a director into the ring, with its back towards the intestine, and its groove towards the symphysis pubis. Along the groove a narrow probe-pointed bistoury is introduced into the ring, and the internal edge of the femoral ligament divided as close as possible to its insertion into the pubes.

The direction in which Gimbernat cut the stricture, is now very generally preferred: the only danger attending it being that of injuring the obturatrix artery in the occasional varieties, in which this vessel originates from the epigastric, and passes over the inner side of the neck of the hernial sac; a case that is calculated to happen in not more than one operation, out of eighty.* Were such an arrangement of the vessel to occur, however, I think a cautious and circumspect operator would be likely to feel its pulsation, and, at all events, by cutting slowly and only a few fibres at a time, with a probe-pointed bistoury, avoid injuring it.

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* This part has been excellently described by Mr. Lawrence, p. 392. edit. 4.; and by A. Burns, in Edinb. Med. and Surgical Journ. vol. ii. p. 265, &c.

† Lawrence, op. cit. pp. 370, 371.

EXOMPHALOS, OR UMBILICAL HERNIA.

Custom appears to sanction the extension of the terms, exomphalos, omphalocele, and umbilical hernia, not only to protrusions of the bowels through the opening of the navel, but to all other tumours of a similar nature, which present themselves any where in the vicinity of that aperture, and the majority of which actually take place in the linea alba, either above or below the precise situation of the umbilicus. The first form of the disease, or that which consists of a protrusion of the bowels through the umbilical ring, is chiefly seen in the fœtus, or very young child; for, soon after birth, the navel, instead of being, as it previously was, the weakest point in the whole course of the linea alba, becomes the strongest, and the least capable of dilatation.

Whoever wishes to acquire an accurate knowledge of the disease now engaging our attention, must view it in its three principal forms: first, as it presents itself in the fœtus; secondly, as it is produced in an infant within a moderate period after birth; and lastly, with the peculiarities, which it exhibits, when it occurs in an adult subject.

1. *Congenital Exomphalos.*

This is the case which sometimes affects the fœtus in utero, and of course exists at birth; the viscera protruding out of the umbilical ring itself, and passing into the cellular substance, which connects the vessels of the cord together. The present form of the disease may commence in any of the stages of gestation; for it is observed in the embryo, and in the fœtus which has not yet acquired its full size, as well as in that which is completely grown. It commonly presents a peculiar appearance, being opaque at its base, where it is covered by the integuments of the belly, and transparent at every other point, where it is merely covered by the cellular membrane of the umbilical cord. The cord itself appears as if it extended out of the apex of the tumour. The transparency of the external investment enables the surgeon to distinguish the hernial sac included in the triangular space, which is left between the separated umbilical vessels. The vein is always above, and the two arteries below, or on one side of the protruded viscera. The portion of the hernia, lying between the separated umbilical vessels, is furnished with two coverings very distinct from each other, the external consisting of the cellular substance of the cord, and the internal being a production of the peritonæum, constituting a true hernial sac.*

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* See J. Cloquet Récherches Anat. sur les Hernies, p. 72.; and Lawrence on Ruptures, p. 435. ed. 4.

The hernial sac may contain a piece of small intestine, a portion of the liver, or where the swelling is of very large size, the liver, spleen, and some of the great intestines. In the fœtus from which fig. 1. plate x. of Scarpa's work was drawn, the hernial sac contained a portion of the great lobe of the liver, which extended in a conical shape between the umbilical vessels; but the whole of the liver is probably never displaced, a circumstance, which seems to be rendered impossible by the adhesions existing between this viscus and the diaphragm.

The principal cause of the congenital exomphalos is referred by Scarpa to an imperfect developement of the abdominal muscles, combined with a considerable size of the viscera of the belly, more especially, the liver. As the umbilical ring in the fœtus is the weakest point, the viscera under such circumstances must be very liable to protrude at it, and gradually make their way into the cellular substance, which connects the vessels of the cord together. He also conceives, that a protracted and difficult labour may contribute, if not to the production of the disease, at least, very seriously to its increase, after it has once commenced.

Children, born with umbilical herniæ, generally live but a short time, either because they are simultaneously afflicted with other malformations of a still more dangerous nature, as spina bifida, an incomplete formation of the cranium, weakness of the abdominal muscles, or considerable enlargement of the viscera, particularly the liver; or because the parts, forming the hernial protrusion, are in the majority of cases irreducible, by reason of their intimate adhesion to the neck of the hernial sac.† Experience proves, however, that there are other cases, of smaller size, capable of reduction, and of a less complicated description, which sometimes admit of cure. At all events, every reducible case, whether large or small, whether complicated with other malformations and infirmities or not, should be carefully reduced, and means taken for hindering the protrusion of the parts again; for, when this indication is fulfilled, and the child continues to live, a radical cure naturally follows. For this purpose, after the reduction of the bowels, a conical graduated compress, covered by a circular quilted pad, is applied to the umbilical ring, and kept in its place with a roller. This practice, which is now recommended by all the best surgeons, is far safer than another method, which consists in attempting the cure with a tight ligature put round the root of the swelling. In the course of two or three weeks, the umbilical ring will frequently be closed. Prudence requires, however, that the apparatus should be worn somewhat longer.

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* Scarpa, Traité Pratique des Hernies, p. 323.

† Scarpa, op. cit. p. 324. Ruysch never saw a case that was saved; which might perhaps be owing either to his meeting with the disease always in an aggravated form, or to the circumstance of his adopting only the palliative method of covering the swelling with a soft plaster; a means which, without a previous effectual reduction of the viscera, must have left the infant to certain death. He remarks: "Hunc affectum sæpius a me visum at numquam curatum memini. Omnes enim ab utero ad tumulum delati fuêre, 5to. 6to. 7mo. 8vo. aut 9vo. die." Obs. Anatom. Chirurg. Obs. 71.

2. *Exomphalos in Young Subjects.*

The true umbilical hernia, which is formed subsequently to birth, presents itself in children after the separation of the funis, and is generally attended with the following particularities: — The swelling is either of a round, cylindrical, or conical shape, with a circular base. No vestige of the cicatrix of the navel can be discerned upon it, except that near the apex, or upon one side of the tumour, a small portion of the skin seems paler and thinner than the rest. Underneath the common integuments another covering is found, consisting of cellular substance, and of that delicate fascia, which is spread over the surface of the abdominal muscles. When this second investment is opened, the true hernial sac is seen, which is thin, semitransparent, and, in every respect, similar to the rest of the peritoneum. It usually contains a noose of intestine, and never, or but very rarely, omentum; a circumstance which Scarpa accounts for by the natural shortness of this membrane in young children.

If, while the umbilical ring is imperfectly closed, suitable pressure be not made upon the navel after the separation of the funis, the child's incessant crying, its straining excited by attacks of colic, and the injudicious custom of applying tight swaddling clothes, sufficiently explain how it happens, that the viscera protrude at the umbilical ring, which is at this period the weakest point of the abdomen. The bowels, in protruding, separate the cicatrix of the integuments from the obliterated extremities of the umbilical vessels, and afterwards gradually distend the same cicatrix, in such a manner, that its wrinkles are effaced, and it can no longer be distinguished from the rest of the integuments of the hernia.*

The quickness with which the navel is closed after birth, and especially the retraction of the cicatrix by the umbilical ligaments, as the growth of the body proceeds, greatly promote the efficacy of bandages, and, in young children, facilitate the radical cure of this species of hernia. A disposition to such protrusions is very common during the first three or four months after birth; but moderate compression suffices for the removal of the swelling, and for keeping the parts reduced. In certain neglected cases, where nothing at all is done, and the disease is allowed to continue for three or four years, the regular employment of a bandage will even then prove successful, and be the means of accomplishing a permanent cure; nay, according to Desault, the disposition of the umbilical ring to contract in young subjects is so great, that the protruded viscera are sometimes forced back by it into their original situation, and a spontaneous cure is the result. The efficacy of pressure in producing this desirable change has been generally acknowledged by the most impartial and experienced surgeons, both of the last and present century. It is singular, however, that Desault, who knew what little assistance nature required, should entertain on this point a different opinion, and recommend the ancient practice of reducing the bowels, and then applying a ligature round the root of the swelling. This plan is found, not only to be more severe than compression, but more liable to be followed by a relapse; and there is great reason to believe, that the partial success which has attended it, has been chiefly owing to the pressure employed for the support of the cicatrix.

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* Scarpa, p. 331.

3. *Exomphalos of the Adult Subject, and Herniæ of the Linea Alba.*

J. L. Petit and Scarpa consider true exomphali, or those which occur through the umbilical ring itself, as peculiar to young subjects, in which sentiment they differ from Sir Astley Cooper[*], who represents the hernia as mostly happening through the navel itself. Monro[†] appears also to join in the latter opinion; for after observing, that, in infants, the protrusion generally happens through the centre of the navel, he remarks, that pregnant women are disposed to the disease, in consequence of the enlargement and weakness of the umbilical ring. Scarpa assures us, that a protrusion exactly at the umbilicus is very rare after childhood, and that if such a disease be sometimes noticed in adults, or even in old persons, the probability is, that it has existed in these subjects from their earliest infancy, though no attention may have been paid to the tumour while it was of small size, and free from inconvenience. He expresses his full conviction, that the hernia, which occurs in the umbilical region of the adult subject, and especially in females during the latter stages of pregnancy, does not protrude exactly through the navel, but only in the vicinity of it, that is to say, on one side or the other of it, or else above or below it. Occasionally, even two herniæ take place near the umbilicus in the same woman, neither of which actually protrudes through that opening.[‡] Scarpa, therefore, classes the common exomphalos of adults with other herniæ of the linea alba, and is very particular in discriminating it from the true exomphalos, which is either congenital or produced during the state of infancy. In adults, the protrusion happens more frequently above, than below the umbilicus; a fact accounted for by the upper half of the linea alba, from the ensiform cartilage to the navel, being naturally broader and weaker than the lower half, the recti muscles becoming situated nearer together as they descend from the navel to the pubes.

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[*] On Crural and Umbilical Hernia, p. 35.

[†] Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 505.

[‡] Monteggia, Institutz. Chirurg. p. 3. sez. 2. § 659.

The true umbilical hernia, whether met with in the infant or the adult, has a circular neck, at the circumference of which the tendinous margin of the umbilical ring can be felt with the finger. Whatever may be the size of the tumour, its body always retains nearly a spherical shape; nor can any wrinkle of the skin, nor any thing at all resembling the cicatrix of the navel, be observed either upon the convexity or upon the sides of the swelling, the skin being merely a little paler and thinner at some points than others: on the contrary, in a hernia of the linea alba, the neck of the swelling is of an oval shape, like the fissure through which the protrusion has taken place. The tumour itself is also constantly of an oval form. When the finger is pressed deeply round its neck, the edges of the aperture in the linea alba are perceptible; and if the hernia be very near the navel, the umbilical cicatrix may be seen on one of the sides of the swelling, a sure indication that the viscera do not protrude through the umbilicus * itself.

In a true umbilical hernia, the shape of the tumour varies according as the patient is fat or thin: in the latter case, it is free and pendulous; in the former, large at its basis, less prominent, and nearly hemispherical. The protruded parts naturally tend downwards, so that the opening into the abdomen is from the upper part, and not from the middle of the swelling; and as the rupture grows larger, this observation becomes more and more applicable. †

A large collection of hydatids within the liver, or upon its surface, sometimes give rise to a tumour at the side of the navel, which is liable to be mistaken for an exomphalos. ‡

Many surgeons of considerable eminence have fallen into the error of supposing, that cases of exomphalos, particularly in adults, seldom have a hernial sac, though it is admitted by several of the same writers, that protrusions in the linea alba are constantly furnished with a peritoneal investment. As Mr. Lawrence observes, it does indeed frequently happen, in consequence of the peritoneum being closely connected to the inflected cicatrix of the integuments, that the distinction between the skin and the hernial sac cannot be traced on the front of the tumour, but it is even then most easily discerned at every other part of the circumference. The umbilical hernia is not only furnished with a true peritoneal sac, but possesses likewise a more superficial investment, derived from a condensation of the surrounding cellular substance. The coverings of this hernia,

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* Scarpa, op. cit. pp. 333—336.

† Lawrence on Ruptures, p. 450. edit. 4.

‡ Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 508.

however, are frequently very thin. In old large cases, portions of the sac are sometimes absorbed, the viscera adherent to the integuments, and the intestine even strangulated in the aperture thus produced in the sac.* Cases exemplifying these facts are now so abundant in the records of surgery, that it is almost superfluous to cite them. Sir Astley Cooper† mentions instances, which fell under his own observation; and the occasional absorption of the sac in large old exomphali, the passage of the intestines through preternatural holes, formed in the omentum, the very thin state of the integuments, and the situation of the bowels immediately under them, have been well explained by Lassus‡, who carefully describes the appearances in the dissection of a woman, who died from mortification of a large umbilical hernia. The knowledge of all these circumstances strongly indicates the prudence and necessity of using the utmost caution in opening an umbilical hernia, as the bowels may otherwise be wounded by the first stroke of the knife.

An umbilical rupture, in an adult, rarely contains intestine unaccompanied by omentum. Such a case, however, was operated upon by my friend Mr. Lawrence.§ The transverse arch of the colon is the bowel mostly protruded, but the small intestines are also frequently found in the sac, and, in some unusual instances, the cœcum.

The exomphalos of the adult subject happens with much greater frequency in women than men, a fact which is explicable by the consideration, that pregnancy has more influence than any other cause in bringing on the complaint. The swelling, indeed, generally becomes larger with every pregnancy; and, as the contents usually consist both of intestine and omentum, the disease mostly increases in size as the individual becomes fatter. Dropsical and corpulent individuals of both sexes are also frequently afflicted. The disease is by no means a common consequence of tapping in cases of dropsy; but facts of this kind are upon record, and Warner has related an example, in which the water was let out by puncturing a protuberance caused by the fluid at the navel, and an umbilical hernia followed, which became strangulated, and required an operation. It may be as well to add, that, in this instance, the paracentesis had been done with a lancet, and that in the description of the operation on the hernia, no mention is made of a peritoneal hernial sac, which, in an exomphalos thus produced, might really be absent.‖

Herniæ of the linea alba, when left to themselves, are much slower in their progress, than the true exomphalos. On account of their small size they are frequently unobserved, especially in corpulent subjects, or when situated at the side of the ensiform cartilage. However, they bring on complaints of the stomach; habitual colics, particularly after meals; and, unfortunately for the patient, he may be troubled for a long while with such disorders before their true cause is detected. On the other hand, a true umbilical hernia may be known from the earliest period of its formation, both by the changes which it produces in the cicatrix of the navel, and by the rapidity of its increase.

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* On Ruptures, p. 452. edit. 4.

† On Crural and Umbilical Hernia, p. 36.

‡ Pathologie Chir. t. ii. p. 64. The skin could not be divided without opening some of the convolutions of the jejunum.

§ On Ruptures, p. 455. ed. 4.

‖ See Warner's Cases in Surgery, p. 229. edit. 4.

These two species of hernia require similar modes of treatment; but the cases which happen in the linea alba, cæteris paribus, are more difficult of cure than the exomphalos; a circumstance which is probably owing to the natural tendency of the umbilical ring to contract, when the hernia is properly hindered from descending, an advantage which does not belong to openings accidentally formed in the linea alba.*

When an exomphalos is not kept reduced with a bandage or truss, but is allowed continually to protrude, its contents often acquire intimate adhesions to each other, and to the hernial sac, so as to form altogether one inseparable mass. Then the intestinal matter has sometimes a degree of difficulty in passing through that portion of the alimentary canal, which is contained in the tumour. Frequently, indeed, it is detained there in sufficient quantity to cause obstruction, in which circumstance, the contents of the intestines accumulate in that part of the canal which is betwixt the hernia and the stomach. In this sort of case, vomiting is one of the earliest symptoms, the obstruction being of that description which the French have called "l'etranglement par engouement." The matter brought up from the stomach often has a fecal smell and colour; and the vomiting, which sometimes takes place without much effort, may be for a long while almost the only complaint.

In the mean while, the surgeon endeavours to reduce the hernia by the taxis; and occasionally the obstruction is removed with the aid of purgative clysters, small repeated doses of the sulphate of magnesia, and the application of ice, or cold lotions to the tumour. In other examples, ten days or a fortnight may elapse, without the symptoms being urgent enough to demand an operation. According to one very experienced surgeon, this urgency commences as soon as the swelling begins to be painful and inflamed, the taxis being then no longer advisable, and further delay likely to be followed by mortification of the protruded intestine.† Several of the best practical writers all concur in one important statement, which a prudent surgeon should constantly recollect, viz. that the exomphalos and herniæ of the linea alba are less subject to true strangulation, than the generality of other ruptures; but, that when it unfortunately takes place, the symptoms are more intense, and the accession of gangrene more rapid, than in any other species of hernia. When in an exomphalos, or hernia of the linea alba, the omentum alone is strangulated, the symptoms are almost as urgent as when the bowel is in the same state. In the former case, however, there is generally only nausea, and if vomiting supervene, it is less frequent and violent, than when the intestine is incarcerated; and the stools are hardly ever entirely suppressed. The reason why the effects of strangulation of the omentum in an exomphalos are more severe, than in inguinal and crural herniæ, is referred by Scarpa to the proximity of the stomach.

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* Scarpa, p. 340.

† Pelletan, Clinique Chirurgicale, t. iii. p. 89.

When practicable, the exomphalos should be reduced, and kept from descending again by means of a well-constructed truss, the uninterrupted use of which, in young subjects, sometimes produces a radical cure. An excellent truss for umbilical herniæ was invented by Mr. Eagland, of Leeds, and described by Mr. Hey.* Scarpa rightly insists upon the propriety of using, both for infants and adults, a pad, which is somewhat conical, and calculated for keeping the bowels completely returned, and the integuments in contact with the umbilical ring, or fissure in the linea alba. However, on account of the difficulty of applying a steel truss to ruptures near the ensiform cartilage, he recommends in these cases a pair of strong linen corsets, under which a compress is applied to the opening. In cases of exomphali, which are of enormous size and irreducible, the only plan, which can be well pursued, with a view of lessening the inconveniences of the disease, and retarding its increase, consists in applying a suspensory.

When, in adult subjects, an operation is unavoidable, on account of the continuance of strangulation, and its effects, the method of proceeding is not materially different from that which has been recommended in describing the treatment of a strangulated inguinal, or crural hernia. If possible, however, still greater caution is necessary, owing to the intimate connection between the integuments and hernial sac, and the adhesions often existing between the latter part and the omentum. The frequent situation of the intestine under the omentum should also be remembered. Scarpa considers a longitudinal incision preferable either to a crucial division of the integuments, or to one in the shape of the letter T. When the sac is opened, the omentum commonly presents itself, or rather constantly does so in adults, unless the bowel happen to protrude through a preternatural opening in that membrane, in which circumstance, the gut will of course lie immediately under the hernial sac. The introduction of a probe into the abdomen is often difficult, on account of the adhesions between the omentum and peritoneum forming the neck of the sac. After having got a probe, or director, into the opening, some surgeons divide the stricture a little way upwards in the course of the linea alba.

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* See his Practical Obs. ed. 3.; also, plate 5. fig. 7, 8, and 9.

Scarpa, however, recommends carrying the incision directly downwards, if the case be a true exomphalos, and laterally, when the protrusion has occurred in the linea alba.* When an exomphalos is large and of long standing, the protruded viscera may have acquired so considerable a size, that their reduction becomes either impossible, or the attempt highly improper. Here, supposing no sign of gangrene to exist, the best plan is to be content with dividing the umbilical ring, and obviating the strangulation, without making any opening into the hernial sac. In the performance of this operation, Scarpa advises us to make a semicircular incision in the integuments on the outside of the neck of the hernia, and then cautiously to divide the subjacent aponeurotic investment. We are next to insinuate a grooved director between the neck of the hernial sac and the umbilical ring, and cut the hard tendinous margin of the latter opening as freely as circumstances may require. If a director cannot pass easily between the sac and the ring, the nail of the left forefinger should be introduced between the neck of the sac and the border of the tendinous opening, which is to be dilated without any injury of the sac itself. This being accomplished, a gentle attempt is to be made to reduce the portion of bowel and omentum nearest the ring. But, when adhesions hinder such reduction, the surgeon is to be content with removing the strangulation. Should it be found impracticable to make a suitable dilatation of the stricture, without cutting the neck of the hernial sac, this must be cautiously opened at the point where the umbilical ring has been already divided.† The preceding method appears much safer, than laying open an enormous swelling, and handling and exposing a large mass of viscera. I have seen one case, however, in which the bowel was strangulated by the pressure of a mass of diseased omentum; no dilatation of the ring was practised; and, though the tumour was large, it was deemed necessary to open the hernial sac.

CONGENITAL INGUINAL HERNIA.

This case differs from all other ruptures in the circumstance of the protruded bowels being in immediate contact with the testicle, the tunica vaginalis serving as the hernial sac.

The old surgeons, apprised by repeated experience of the occurrence of these herniæ, in which the protruded bowels and testicle lay together in the cavity of the tunica vaginalis, were much embarrassed how to offer a plausible explanation of the mode, in which the viscera got into this singular situation; but, the general idea was, that these cases had all been originally common bubonoceles, and that the bowels afterwards passed into the cavity of the tunica vaginalis, in consequence of the ulceration, or bursting of the intervening parts. The French surgeon, M. Méry*, however, should be excepted from this statement; for, after making a very careful dissection of a congenital inguinal hernia, he came to a more correct conclusion than many later anatomists and surgeons, including even Mr. Samuel Sharp, the majority of whom, at the period when the Critical Inquiry was written, subscribed to the above mistaken notion.

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* Scarpa, p. 365.

† Ibid. p. 362.

Méry had discernment enough to find out, that the bowels did not descend into the tunica vaginalis by a destruction of the parts intervening between the testis and the contents of an ordinary bubonocele; and he even suggested, that there must have been a process of peritonæum in the scrotum, communicating with the cavity of the abdomen, and ready for the reception of the viscera. However, he pursued the investigation no further, so that it remained for Haller, Hunter, and Pott, to enrich pathological science by a more ample explanation of the true nature of the congenital inguinal hernia, and of the way in which its origin is connected with the situation and descent of the testis in the young subject.

The origin of this species of hernia is as follows: until the approach of birth, the testes of the fœtus are lodged within the cavity of the abdomen, and situated immediately below the kidneys, on the forepart of the psoas muscles, by the side of the rectum, which bowel is larger in proportion to the capacity of the pelvis, than in the full-grown subject, and lies before the lumbar vertebræ as well as the os sacrum. The anterior and lateral surfaces of the testis are covered by reflected peritonæum, while posteriorly it adheres to the psoas muscle by means of cellular substance.† A little while before birth, generally in the eighth month ‡, but sometimes subsequently to this event, the testes descend through the abdominal ring, and then pass through a kind of membranous canal, which the peritonæum forms from that aperture into the scrotum. Thus, as they were already furnished with one peritoneal investment up in the loins, a second is acquired by their entering this canal, or rather elongation of the peritonæum. The first covering, which is smooth, and every where closely adherent to the surface of the testis, constitutes the tunica albuginea; while the other, which is denser, and in front loose and unconnected, becomes the tunica vaginalis. "While the testis is descending (says Mr. Hunter), and even when it has passed into the scrotum, it is still covered by the peritonæum, exactly in the same manner, as when within the abdomen; the spermatic vessels running down behind the peritonæum there, as they did when the testis lay before the psoas muscle. That lamella of the peritonæum is united behind with the testis, the epididymis, and the spermatic vessels, as it was in the loins, and likewise with the vas deferens; but the testis is fixed posteriorly to the parts against which it rests, being unconnected and loose forwards, as while it remained in the abdomen. In coming down, the testis brings the peritonæum with it; and the elongation of that membrane, though in some circumstances it be like a common hernial sac, yet, in others, is very different. If we can imagine a common hernial sac reaching to the bottom of the scrotum, covered by the cremaster muscle; and that the posterior half of the sac covers, and is united with the testis, epididymis, spermatic vessels, and vas deferens; and that the anterior half of the sac lies loose before all those parts, it will give a perfect idea of the state of the peritonæum, and of the testis when it first comes down into the scrotum. The testis, therefore, in its descent, does not fall loose, like the intestine, or epiploon, into the elongation of the peritonæum; but, slides down from the loins, carrying the peritonæum with it; and both that (the testis) and the peritonæum continue to adhere, by the cellular membrane, to the parts behind them as they did when in the loins." * Soon after the testes have arrived in the scrotum, the upper part of the peritoneal canal is gradually shut up and obliterated, by which change, all communication between the cavity of the peritonæum and that of the tunica vaginalis is effectually annihilated. The exact period of time, when the peritoneal canal closes, probably differs a little in different individuals, as the most correct writers are not entirely agreed about it†; but, according to John Hunter and Wrisberg‡, both testes have usually got to the bottom of the scrotum in the ninth month, and the passage is closed. Sometimes, however, the complete closure of the peritoneal canal, through which the testis descends, is certainly delayed for a greater or lesser space of time after the child is born, in which circumstance, if any of the bowels be forced into it, they become, of course, as long as they continue unreduced, an impediment to its further obliteration. The communication, between the cavity of the abdomen and that of the tunica vaginalis, then continues open, and the protruded bowel, and the testis, covered merely by its albuginea, lie together in one and the same sac, which is the tunica vaginalis itself. Such is the nature of the ordinary congenital inguinal hernia.§

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* Mém. de l'Acad. des Sciences, ann. 1701. p. 282. obs. 3.

† See Obs. on Certain Parts of the Animal Œconomy, by John Hunter, pp. 2, 3.

‡ Op. cit. p. 9.

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* Observations on Certain Parts of the Animal Œconomy, p. 10.

† Camper found the communication between the abdomen and tunica vaginalis open in 11 new-born infants out of 17, which he examined. Comment. Societatis Reg. Scientiarum, Gotting. 1778.

‡ See Observations on Certain Parts of the Animal Œconomy, p. 9. edit. 2., also p. 12., where it is observed, " It is seldom that any aperture remains in a child born at its full time."

§ " It should be observed, however, that the hernia congenita may happen, not only by the intestine falling down to the testis before the aperture of the sac is shut up, but perhaps afterwards; for, when the sac has been recently closed, it seems possible enough that violence may open it again." Hunter, in Obs. on Certain Parts of the Animal Œconomy, p. 15.

In a common rupture, the viscera push out with them a portion of the great bag of the peritonæum, which, thus forming one of the most regular investments of the displaced bowels, is called the *hernial sac.* But, in the congenital inguinal hernia, the sac, in which the viscera lie, is not thrust forth in this manner by the displaced bowels: on the contrary, it is a production of peritonæum originally formed, and placed ready for the reception of the testes on their descent from the loins, but, into which the bowels are sometimes accidentally propelled, before the passage leading into it from the belly is duly closed. The congenital inguinal hernia, therefore, differs from the generality of ruptures in having no hernial sac, formed and produced by the peritonæum being thrust forth from the belly by the displaced bowels themselves. There is, indeed, one very uncommon species of scrotal hernia, contained in the tunica vaginalis, yet included also in a common hernial sac, so that the protruded bowels neither lie in contact with the preceding membrane, nor with the albuginea. This particular case was first noticed and described by the late Mr. Hey: it seems to be formed, after the communication of the cavity of the peritonæum with that of the tunica vaginalis has been obliterated, but previously to the closure of the passage lower down.*

It is curious, that the above-described peritoneal canal, forming in the fœtus a communication between the abdomen and the scrotum, should sometimes remain open a considerable time after birth, without being attended with any hernial protrusion; a fact, fully authorising the inference, that we should look to other circumstances, besides the descent of the viscera, for an explanation of the cause by which the closure of this canal is deferred to so late a period. In consequence of the passage being thus left unobliterated, for a great length of time, however, a rupture of precisely the same nature as the congenital inguinal hernia may first happen long after birth; while the instances, in which this conformation exists, unaccompanied with any protrusion, amount to an unequivocal proof, that this species of rupture essentially requires for its production, not only a pervious state of the peritoneal canal, but also the operation of a cause, capable of determining the bowels to fall down into the passage.

The delay of the testis at the ring, and the consequent dilatation of the corresponding portion of the peritoneal canal, ought probably to be regarded as one of the most common predisposing causes of congenital inguinal hernia: Sandifort † inclines to this sentiment delivered by Richter, which has still higher support in the authority of John Hunter, to whom the suggestion perhaps strictly belonged; but an exception must be made of those instances, in which the hernia appears to be the consequence of an adhesion between the bowels and the testis previously to its descent. Nor can Richter's explanation be applicable to cases, where the viscera protrude into the tunica vaginalis, while the testis remains within the abdomen, never having reached the upper part of the peritoneal canal at all. At the same time, it may be conceived, that, in this particular example, the protracted descent of the testis may lessen the tendency of the upper portion of the tunica vaginalis to close at the usual period, and thus become a predisposing cause of the protrusion of the bowels.*

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* Hey's Practical Obs. in Surgery, p. 221, &c. Another case of the same nature is described in Sir A. Cooper's Work on Inguinal and Congenital Hernia, p. 59.

† "Nullatenus tamen negandum est, hærentem nimis diu in fissura obliqui externi et apertura canalis, testem, has partes sic dilatare, ut postea vix debito modo sese claudere possint, sed ostium productionis peritonæi aptissimum maneat quod intestina, vel minimo nisu eo versus depulsa, admittat." Icones Herniæ Inguinalis Congenitæ, p. 22.

Another fact, very necessary to be understood, is, that the common forms of this disease are seldom produced by the bowel insinuating itself into the passage simultaneously with the testis. Before birth, the small intestines are but little distended, and, in the absence of respiration, they can suffer no compression from the diaphragm and abdominal muscles. Under these circumstances, it is difficult to imagine, how they can protrude from the cavity of the belly; and, in fact, notwithstanding the use of the expression, "congenital," the disease is hardly ever observed in infants directly they are born, but makes its first appearance afterwards. The child only brings with it into the world a state of parts, which is favourable to the occurrence of the complaint; or, in plainer terms, it is born with a free communication between the cavity of the peritonæum and that of the tunica vaginalis. When, says Mr. Hunter, the testis has remained in the cavity of the abdomen beyond the usual time, it is impossible to say, whether the disposition for closing up the passage is in any degree lost, or not; but, when it comes down after birth, we can easily suppose a portion of intestine, or epiploon, is more likely to descend, and prevent the closure of the mouth of the sac, than before the child was born, when certain actions had not taken place. †

Some congenital herniæ have been known to take place, for the first time, as late as the ages of twelve, fifteen, twenty, and even thirty. Probably, in several of these examples, the testicle had remained all this while within the abdominal ring ‡; and without descending into the scrotum §; and when it did descend, the bowels followed it.

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* "*The descent being thus early*, and the passage being almost immediately closed, are the principal means of preventing the hernia congenita." Obs. on Certain Parts of the Animal Œconomy, p. 9.

† Obs. on Certain Parts of the Animal Œconomy, p. 16.

‡ The descent of the testis is very slow, when not completed before birth; the process indeed often occupies years, and even then the testis sometimes never reaches the lower part of the scrotum. According to Mr. Hunter, the completion of the descent, in retarded cases, most frequently happens between the ages of two and ten, while the person is young and growing, and is seldom delayed beyond the age of puberty. Op. cit. p. 16.

§ In one patient, aged 20, both the testes, which till then had been concealed

One accidental circumstance, however, may make a rupture strictly congenital; or, I should rather say, it is now proved by the observation of a large number of cases, that there are two states, which are conducive to this less frequent event. Before birth, either a part of the intestine, or omentum, may adhere to the testis previously to its leaving the abdomen, so that when this gland descends into the scrotum, the connected bowel necessarily follows it: or the peritonæum, investing the spermatic vessels, may send off a short fold, resembling a ligament, to the adjacent part of the ileum, or cœcum, by means of which membranous fold the bowels, on the right side, where congenital herniæ are most frequently noticed, are drawn down from their natural situation in the groin, when the testis passes into the scrotum.*

The formation of such adhesions between the bowels and testis before birth, may also sometimes prevent, or at least, seriously retard its descent. In an infant, which had only one testis in the scrotum, and died a few hours after birth, the opposite one was found close to the ring, and connected to the omentum by three slender filaments. † In the body of a very aged subject, the left testis, which was of its natural size, was found situated between the iliacus internus and psoas muscles, an inch from the superior opening of the peritoneal canal. The epididymis, which was well formed, adhered to the sigmoid flexure of the colon by means of a whitish, strong, round filament. ‡

The congenital inguinal hernia cannot be divided, like bubonoceles, into *external* and *internal*; but must evidently always be *external*, since the neck of the tunica vaginalis invariably corresponds to the point, at which the spermatic cord passes under the border of the transversalis muscle. The tunica vaginalis has also the same anatomical relations as the sac of a common inguinal hernia; like it, passing completely through the inguinal canal, from one end of it to the other, and lying on the front of the spermatic cord. Of course, it passes through the separation between the lower fibres of the obliquus internus, and the principal origin of the cremaster muscle. On coming out of the ring, it still adheres closely to the spermatic cord, and is enclosed in the muscular and aponeurotic expansion of

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in the abdomen behind the rings, were suddenly expelled from these openings, in a violent exertion made to leap over a wide ditch: their issue was soon followed by a descent of the bowels. See Dict. des Sciences Medicales, t. xxi. p. 161. Mr. Hunter knew a rupture happen in a man thirty years old, where the testes had not even got into the ring. Obs. on Animal Œconomy, p. 17. edit. 2.

* Wrisberg, Observat. Anatom. de Testiculorum Descensu, p. 48. Sandifort has also detailed a case, in which the appendicula vermiformis, which was adherent both to the testis and the sac, had drawn down the cœcum, and part of the colon, and ileum. Icones Herniæ Inguinalis Congenitæ, p. 12. Wrisberg saw two other strictly congenital ruptures on the right side, both induced in a similar manner. Op. supra cit. pp. 24, 25.

† Wrisberg, Comment. Societ. Scient. Goetting. 1778. p. 43, &c.

‡ Jules Cloquet, Récherches sur les Causes et l'Anatomie des Hernies Abdominales, Obs. 6. t. 24. 4to. Paris, 1819.

the cremaster, which accompanies it to the bottom of the scrotum. As the tunica vaginalis, containing the protruded viscera, enters the inguinal canal beyond the point, at which the spermatic cord crosses the epigastric artery, it is clear, that, by following precisely the direction of the cord, it must also cross the artery, and push it from the external to the internal side of the ring. The epigastric artery, therefore, is constantly displaced, in the congenital inguinal hernia, just as it is in the common *external* bubonocele. [*]

A congenital inguinal hernia is, at first, generally an enterocele, the omentum in young infants being too small and short to protrude under ordinary circumstances down into the scrotum. However, when the testis, previously to its descent, becomes accidentally adherent to the omentum, the disease may be from the first, and in the youngest subject, an epiplocele [†]; and, in other cases, where no such connexion exists, the omentum may afterwards descend into the hernial cavity. As Sandifort remarks [‡], not only has intestine alone been found in this species of hernia, but, in a more advanced age, the omentum, either with, or without, a portion of the bowels, has formed the contents of the tumour.

The most important symptom, by which a congenital inguinal hernia may be distinguished from a common scrotal rupture, is the situation of the testis, which, in the latter disease, can always be plainly felt towards the lower and back part of the tumour. But, in a congenital hernia, if the protrusion be at all considerable, the testis cannot be felt while the bowels are down. When we hear also, that the patient has had the complaint from his earliest childhood, we have strong reason for suspecting the case to be of the congenital kind. But, when such intelligence is communicated to us, we are not, without further consideration, to pronounce the disease positively to be congenital rupture; for, experience proves, that every hernia in a child is not invariably of this description. A bubonocele has been seen in a child only fourteen months old, and, what is also worthy of notice, the case was strangulated, and required the operation. [§]

According to Monro, the tumour, formed by a congenital inguinal hernia, passes out perpendicularly from the abdomen; because, in a new born infant, the spermatic cord does not pass obliquely through the parietes of the abdomen, as in the adult, but directly through them. [||]

Scarpa adverts also to the following circumstances, the recollection of which will be of great service in distinguishing a congenital from a common inguinal hernia: — 1. When this last case, whether external or internal, passes into the scrotum, it cannot descend beyond the point, where the spermatic vessels enter the testicle. Here the cellular membrane of the spermatic cord terminates, and here the hernial sac must necessarily be stopped. On the contrary, in the congenital hernia, the viscera may descend lower than the testicle, with which they are in immediate contact, and may at length even occupy its place, pushing it upwards and backwards. — 2. In a congenital hernia, the viscera usually pass from the groin down into the scrotum in a very short space of time, and, as it were, precipitately; but, in a common inguinal hernia, the protrusion is generally slower and more gradual. The reason of this difference is sufficiently manifest: in the former case the descent of the testicle, and the ready-formed tunica vaginalis, have opened and prepared the course, which the viscera are to follow as they protrude; while, in the latter, the hernial sac can only get into the scrotum by gradually elongating the layers of cellular substance, which connect it to the surrounding parts. This fact, says Scarpa, is so generally admitted, that experienced practitioners consider the quickness, with which the bowels have descended from the groin into the scrotum, a characteristic mark of a congenital scrotal hernia. *

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[*] Scarpa, Traité Pratique des Hernies, p. 74.

[†] Thus Mr. A. Burns found the omentum which had previously adhered to the testes, and been dragged from the abdomen along with that organ, in the congenital hernia of a new-born infant. See Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 511. 8vo. Edin. 1811.

[‡] Icones Herniæ Inguinalis Congenitæ, p. 24.

[§] See Lawrence on Ruptures, p. 65. edit. 3.

[||] Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 510.

Sometimes the testis is so enveloped in the omentum, that the disease may be, and indeed has been, mistaken for a sarcocele. †

The viscera, included in a congenital hernia, but more especially the omentum, are frequently adherent to the testis; a complication attended with serious inconvenience ‡; for, whenever an endeavour is made to reduce the hernia, the testis is forcibly drawn up to, or even within, the abdominal ring; the patient is subjected to a good deal of pain, the hernia cannot be effectually returned, and the use of a truss is inadmissible. It was a very slender connexion of this sort, which made the rupture of the celebrated Zimmerman irreducible, and caused him such annoyance, as induced him to submit to a fatal operation. The omentum, often thickened, and changed into a firm cylindrical mass, may also adhere either to the sac, or the epididymis, or both §, and a similar connexion is often remarked between the testis, the sac, and the intestine. ‖ Sometimes the testis remains at, or within the abdominal ring, while a piece of intestine lies in the scrotum. ¶ This is another case, in which a

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* Scarpa, Traité Pratique des Hernies, pp. 75, 76.

† Méry in Mém. de l'Acad. Royale des Sciences de Paris, An. 1701. p. 279.

‡ Meckel, Tractatus de Morbo Hernioso Congenito Zimmermani.

§ J. Cloquet, Recherches sur les Causes et l'Anatomie des Hernies Abdominales, Ob 78. p. 102. 4to. Paris, 1819.

‖ Sandifort, Icones Herniæ Inguinalis Congenitæ, p. 15.

¶ See Pott's Chirurgical Works, vol. ii. p. 117. edit. 1808.

truss cannot be rightly employed. When the testis lies in the groin, it may also be so covered and concealed by the protruded bowel, or omentum, as not to admit of being plainly felt, in which circumstance, it is very liable to be injured, either in the taxis, or an operation with the knife. The possibility of a strangulation happening, before any further descent, either of the testis or bowels, has taken place, is proved by several facts upon record. Thus Reichel saw a boy, about four years old, whose scrotum was yet empty, in whom the ileum was strangulated with the testis at the abdominal ring*; and Pelletan records a case, where the testis lay at the upper and outer part of the ring. The rupture was always easily reducible, and when the patient was sixteen, the bowels after being returned, did not protrude again till he was nineteen years old. This event was attended with some pain, but still the hernia admitted of being reduced with ease. One day, however, it could not be got up again, and became strangulated:—but, on the following day, the bowel was reduced in the Hôtel Dieu. The patient felt some relief; but the pain did not entirely cease, and the vomiting continued; the testis being prominent at the external side of the ring. Although the hernia, after falling down and being once more reduced, did not make its appearance again, the patient got worse and worse, and died on the fourteenth day. Before death, the prominence of the testis was remarked to be greater than usual. On dissection, besides the general marks of inflammation in the abdomen, a noose of the ileum was found strangulated by the pressure of the testis within the ring.†

When, in the instance of a protrusion of the intestines into the upper part of the tunica vaginalis, the testis happens to be nearly or quite on the outside of the ring, the occasional employment of gentle pressure is recommended, in order to promote the descent of that gland into the scrotum. According to Richter, this is the only chance of preventing the rupture from becoming strangulated, and when it fails, (supposing the symptoms should be urgent,) an operation is the only resource.‡ Here the knife must be used with particular circumspection, lest the testis be injured; an accident, of which there would be great risk, if that body were adherent, as it frequently is, to the protruded bowels. In operating upon a patient in the foregoing state, it does not appear to me, (though it did so to Richter,) that our aim should be to make the testis pass either further down, or back again into the ring, for the purpose of enabling the patient to wear a truss. But if we are obliged to use the knife, I conceive, our interference should be limited to the great indication of liberating the strangulated viscera, and effecting their reduction; for, when their constriction is removed, the immediate source of danger is obviated, and nature undisturbed will best do the work of bringing the testis down into the scrotum.

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* Ludwig. Advers. Medic. Pract. vol. iii. pp. 736, 737.

† See Pelletan's Clinique Chir. tom. iii. p. 394.

‡ Anfangsgr. der Wundarzn. b. v. p. 436.

These remarks apply to cases, in which an operation is undertaken; and, where we have it in our power, at all events, by means of it to remove the stricture. But things are very different when the knife is not used; and, perhaps, then certain modes of proceeding with respect to the testis may be right and necessary, in order to liberate the hernia, without the hazard of an operation, which modes would be highly wrong, were the risk of such operation to be encountered. Thus, cases present themselves, where the testis lies so far within the ring, that it can scarcely be felt externally; yet, gradually, or from some very slight cause, it protrudes in a more sudden manner, and immediately brings on symptoms of strangulation: here I should not find fault with the practice of trying to get rid of the strangulation by pressing the testis back again; a thing, which Richter says can generally be accomplished.*

The upper part of the peritoneal canal is generally closed and obliterated, soon after the passage of the testis into the scrotum. This disposition of the canal to close is also sometimes evinced in cases of hernia. Several contracted points may occasionally be remarked in the neck of the sac of a congenital hernia, and even be the cause of strangulation. In such circumstances, the surgeon must take especial care to lay open the hernial sac its whole length up to the ring, in order to set the parts free, and this being done, there will frequently be no necessity for dilating the ring itself.

The treatment of a congenital inguinal hernia is to be conducted on the same general principles, which apply to other ruptures. A radical cure is often easy of accomplishment; for, after the viscera are reduced, the passage, or communication between the abdomen and scrotum, has a natural tendency to close, and in young persons will always do so, provided care be taken to prevent the bowels from descending again by the regular and uninterrupted use of a well-made truss. If the patient be young, the cure may even be completed in the course of a few weeks. This facility of cure, however, diminishes as the individual grows older, and, after the adult age, little expectation can be indulged, that the patient will ever recover so perfectly as to enjoy security, without the constant employment of a truss. As Mr. Pott has correctly stated, a piece of intestine, or omentum, may get pretty low down in the sac, while the testis is in the groin, or even within the abdomen. In these cases, the application of a truss would be highly improper; for, in the latter, it might prevent the descent of the testis from the belly into the scrotum; in the former, it must necessarily bruise and injure it, give a great deal of unnecessary pain, and can prove of no real use. Such bandage, therefore, ought never to be applied, unless the testis can be fairly felt in the scrotum, after the bowels are replaced.

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* Anfangsgr. der Wundarzn. b. v. p. 437.

In young subjects, in whom no congenital hernia actually exists, but one or both testes have not yet passed the ring, their descent should be watched, because it is a period when a tendency to a hernial protrusion must prevail. Here, as soon as the testis has got some way below the ring, a truss, of a construction that will not hurt the testis, should be applied, with a view of preventing a hernia, and aiding nature in the process of obliterating the communication between the abdomen and scrotum. When, however, a hernia takes place in a patient whose testis has not descended, and whose age makes it doubtful whether it ever will descend, or such descent be advantageous, Mr. Hunter thinks a truss should be applied immediately the bowels are reduced.*

In the operation, the testis will often be found between the intestine and omentum; and, after their reduction, it will be left quite bare in the exposed cavity of the sac. As it is a part very sensible and prone to inflammation, it should never be unnecessarily handled and disturbed. Indeed, I should here recommend surgeons to listen to the advice of Mr. Lawrence, who says the hernial sac should never be laid open below the upper part of the testis, unless the freeing of the protruded bowels from adhesions were to render a more extensive exposure of the cavity of the tunica vaginalis indispensable.†

The sac of a congenital rupture is frequently very thin; sometimes so thin, and at the same time so firmly adherent to the skin, that both parts are opened together by the same stroke of the knife.

Pott and Wilmer believed, that the congenital inguinal hernia was more subject, than a common bubonocele, to that kind of strangulation, which is caused by the neck of the hernial sac. Out of five congenital herniæ which Wilmer operated upon, three were strangulated in this way, and not at all by the ring. Sandifort ‡, remarked the same thing in the body of a young man who had died of a strangulated congenital hernia: the operation having proved ineffectual, in consequence of the surgeon neglecting, as he dilated the ring, to divide the neck of the hernial sac, which was the principal seat of the strangulation. In a case, dissected by Dr. A. Monro, junior, there was a stricture in the middle of the peritoneal canal, and a part of the omentum, which descended below the constriction, was of unnatural bulk.*

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* Obs. on certain Parts of the Animal Œconomy, p. 17.

† Lawrence on Ruptures, p. 502. edit. 4. In an example related in a modern work, delirium and a severe inflammation of the testis, with a large abscess on each side of the scrotum, followed an operation for congenital hernia. As there were some slight adhesions between the testis and the protruded small intestine, it had been necessary to lay open the tunica vaginalis. See Pelletan's Clinique Chir. tom. iii. p. 84, &c.

‡ Museum Anat. Acad. Lugdun. vol. ii. tab. 91, 92.

The parts are often girt by a contraction of the hernial sac, not only where it communicates with the abdominal cavity, but also in other situations, where we should not have expected this occurrence.† Such constrictions occasionally form even towards the lowest part of the sac: a case indeed uncommon; but, when it does happen, likely seriously to embarrass a surgeon not apprised of its possibility. In this manner, the inferior part of the sac of a congenital hernia may become completely shut up, so as to leave the tunica vaginalis a distinct and separate cavity. When this separation is accomplished, the bowels are no longer contained in the same cavity with the testis; and the rupture, which was at first congenital, is now changed into a case not very different from a common bubonocele. This observation, with a case illustrative of it, I find in the work of a modern writer, who has availed himself of the extraordinary opportunity of dissecting nearly six hundred subjects afflicted with herniæ.‡

In operating upon congenital herniæ, therefore, we should be aware, that the protruded bowels may be strangulated by a contraction of the neck, or even of the body, of the hernial sac, while the abdominal ring itself may have no share in producing the evil. Where, however, it is requisite to dilate this opening, the incision may always be made with perfect safety, either directly upwards, or upwards and outwards; the displacement of the epigastric artery to the inner side of the neck of the hernia being regular, and constant in its occurrence, for reasons already detailed.

Sometimes an aqueous fluid collects in the sac of a congenital hernia, either with or without a protrusion of the viscera, forming a true hydrocele of the tunica vaginalis, but attended with the peculiarity, that the water can be pressed back into the abdomen. According to Sir A. Cooper, the nature of the case may be ascertained by returning all the contents of the tumour into the cavity of the abdomen, when the patient is in a horizontal posture, and then, on putting the finger against the abdominal ring, and letting the patient stand up, the water will fall into the scrotum; if the pressure of the finger be now diminished, and the patient cough, the intestine and omentum will be felt falling down into their former situation. In young subjects, the fluid is in the end generally absorbed, and no operation is necessary on its account.

The pervious state of the peritoneal canal, and the descent of the bowels into the same cavity with the testis, do not render the patient altogether exempt from the possibility of the peritonæum becoming dilated into a hernial sac through the abdominal ring; thus a double rupture may be produced on the same side.*

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* Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 509.

† Lawrence on Ruptures, p. 502. edit. 4.

‡ J. Cloquet, Recherches sur les Causes et l'Anatomie des Hernies abdominales, p. 60. Obs. 57. 4to. Paris, 1819.

HERNIÆ OF THE CŒCUM AND COLON.

Herniæ of the fixed parts of the cœcum and colon, have a strong claim to separate consideration, their differences from common herniæ being, on various accounts, remarkable, and highly interesting in practice. In the first place, the nature of the adhesions, which occur in certain herniæ of the large intestines, is such as to merit the serious attention of the practical surgeon; for they have no analogy to the adhesions, which are met with in other herniæ, and are the result of adhesive inflammation, for they are actually composed of the same bands, which naturally fixed the bowel in the cavity of the abdomen, and have been carried with it into the scrotum. The importance of being aware of this fact is self-evident; for, were such adhesions to be regarded and treated in the same way as those connections, which arise from the effusion and organization of coagulating lymph, and which are not unfrequently divided with the scalpel, dangerous and even fatal consequences might arise.

Natural adhesions are not observed in all scrotal herniæ, but only in those of the large intestines, that is to say, in scrotal ruptures on the right side, formed by the cœcum, the appendix vermiformis, and the beginning of the colon; and in such herniæ on the left side as contain the sigmoid flexure of the colon. In the natural state, the cœcum and the ascending colon are firmly fixed in the right ileo-lumbar region, by means of two folds of the peritonæum, one of which is attached to the os ilium; and the other, to the external margin of the psoas muscle.

In dissecting scrotal herniæ of the right side, formed by the cœcum, the appendix vermiformis, and commencement of the colon, Scarpa remarked, that these bowels had drawn after them into the scrotum the layer of the peritonæum, by which they were naturally fixed in the right ileo-lumbar region, so that this portion of the great bag of the peritonæum contributed to the formation of the hernial sac, on opening which, the intestines were seen connected to its parietes, just as they were in the cavity of the abdomen previously to their displacement.

By repeated examinations, he traced, as it were, the progress of nature in the formation of these herniæ. He found in a male subject, fifty years of age, an inguinal hernia of the right side, as large as a hen's egg, containing merely the fundus, or unfixed portion of the cœcum. The fold of peritonæum, which fixes this bowel in the lumbar region, had already undergone very considerable displacement, having descended to within an inch of the abdominal ring; but, as it had not yet got into the hernial sac, the intestine was easy of reduction. In another individual, he found the same species of hernia advanced a degree further: the whole of the cœcum was contained in the hernial sac, together with the appendix vermiformis, and beginning of the colon. The external side of the neck of the hernial sac was evidently formed by the portion of peritonæum, which in the natural state invests the ileo-lumbar region; the cœcum and beginning of the colon were attached to this part of the parietes of the sac by the same duplicatures of peritonæum which naturally bind them down in the right flank. An adhesion of a similar nature united the appendix vermiformis to the portion of hernial sac, corresponding to the little mesentery of this appendix. It was impossible to reduce the cœcum and beginning of the colon completely, because the above-described adhesions reached about two inches below the abdominal ring. In a third subject, a man, sixty years of age, who had died with a very large old scrotal hernia of the right side, Scarpa found in the hernial sac not only the cœcum and beginning of the colon, but also the extremity of the small intestines: all these viscera together composed a considerable mass, by which the scrotum was distended. The duplicatures of peritonæum, constituting the natural attachments of the cœcum and beginning of the colon, were also manifestly seen forming a part of the hernial sac, and extending to the peritoneal coat of these viscera, so as to constitute a natural adhesion. The fundus of the cœcum was free and unattached, as it naturally is in the cavity of the abdomen: it could also be made to reascend a little towards the ring; but all the rest of this bowel, as well as the beginning of the colon, was so intimately and extensively adherent to the parietes of the hernial sac, that it was quite impracticable to reduce it. The fundus of the cœcum, that is to say, all its unattached portion, had undergone considerable enlargement, and descended to the bottom of the scrotum. This is what happens in all herniæ of this description, in consequence of the accumulation of fecal matter in that intestine. The right colon was also drawn considerably towards the groin, as well as the fold of peritonæum, serving for its attachment.

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* Sandifort, Obs. Anat. Pathol. lib. 1. p. 71.

Natural adhesions of the large intestines to the hernial sac, may also take place in a scrotal hernia of the left side, when the protrusion consists of that portion of the colon which is naturally fixed in the left ileo-lumbar region. The left lumbar colon is attached on one side to the mesocolon, and on the other to the layer of peritonæum investing the ileo-lumbar region, by means of broad membranous duplicatures of peritonæum which accompany the bowel to the place where it crosses the iliac vessels, as it passes towards the pelvis to form the commencement of the rectum. When the portion of the colon, which is situated above the iliac vessels, descends into the scrotum, the hernial sac will necessarily consist of the layer of peritonæum lining the ileo-lumbar region, and consequently of the folds of this membrane, which served to fix the bowel in its natural situation. In this species of hernia, as well as in that which is composed of the cœcum, a portion of the great intestine will always be found connected to the hernial sac by the same bands which fixed it in the cavity of the abdomen.

When a preternatural looseness of the fold of the peritonæum, which fixes the cœcum, is conjoined with a weakness of the aponeurosis of the right external oblique muscle, a protrusion of that bowel is liable to happen. The abdominal muscles and diaphragm make equal pressure upon all the viscera of the belly; but, in the circumstances suggested by Scarpa, the cœcum and beginning of the colon will be more disposed to yield to this pressure and protrude, than any other part of the intestinal canal. Large accumulations of indurated fecal matter in the cœcum may also materially increase this tendency to displacement. A hernia of the cœcum may sometimes be consequent to that of the ileum, which having first descended into the scrotum, successively draws after it the cœcum with its appendix, the beginning of the colon, and the membranous folds constituting the attachments of these viscera. When a hernia of the cœcum is congenital, Scarpa believes, that it is produced by an adhesion, which the testis contracts with that intestine previously to its descent into the scrotum.

A scrotal hernia, formed by the cœcum, the appendix vermiformis, and beginning of the colon, is constantly of a very considerable size; but the case cannot be recognized by this character, and, even in the operation itself, it is attended with appearances well calculated to produce mistake. In fact, after dividing the integuments, one might be led to suppose, that the hernial sac was either lacerated, or entirely deficient: but if attention be paid to the natural situation of the cœcum and beginning of the colon in the right ileo-lumbar region, and it be recollected, that these bowels are partly situated out of the peritonæum, it will at once appear clear enough, that, in a hernia, they can only be in part surrounded by a hernial sac, a portion of their external side being in immediate contact with the adjoining cellular substance. In such a case, were an uninformed practitioner to direct his incision a little too much towards the outside of the tumour, he would find the cœcum and colon immediately under the cremaster, and be induced to believe, that these bowels had no hernial sac. But, says Scarpa, he would quickly recover from his mistake, if he were to cut into the hernia on the middle line, or on its internal side; for then he would be sure to find under the cremaster and subjacent cellular membrane, the true hernial sac, containing the greatest part of the cœcum with the appendix vermiformis. At the same time, he would remark a broad membranous fold, extending from the parietes of the sac to the surface of the intestine, of which a small part is on the outside of the hernial sac, just as it was on the outside of the cavity of the peritonæum in the right lumbar region.

In explaining why some herniæ of the cœcum are reducible, and others irreducible, Scarpa reminds us of the well-known difficulty, and even impossibility, of reducing a large scrotal hernia, when formed by the cœcum, the appendix vermiformis, and beginning of the colon, owing to the strong connexion which these bowels have with the hernial sac. Such connexion is not formed by any preternatural adhesion, but only by the folds of peritonæum which, in the natural state, fixed the upper portion of the cœcum in the right ileo-lumbar region. Before Scarpa, no writer had satisfactorily explained why in some inguinal, or scrotal herniæ of the cœcum, adhesions, unpreceded by any inflammation, prevail betwixt this intestine and the hernial sac. Nor had the least attempt been made to investigate the cause, why herniæ of this description, which are recent and of small size, may be easily reduced, while larger cases are irreducible, and always complicated with intimate adhesions to the hernial sac. In the first case, the hernia merely consists of the cul-de-sac of the cœcum; and as this part of the bowel is completely unattached in the abdomen, it is generally so in the hernial sac. On the contrary, in the second case, the whole of the cœcum, with a part of the colon, being included in the hernia, and the natural attachments of these viscera making part of the hernial sac, the consequence is, that they are fixed at the bottom of the scrotum, in the same manner as they were in the right ileo-lumbar region previously to their displacement.

Whenever an operation is to be done on a large, old scrotal hernia of the right side, the first thing which the surgeon should consider, is whether the disease is not produced by the cœcum and beginning of the colon. Besides the size and long standing of the tumour, its irregular knobby shape may excite a suspicion of such a complication. The probability of the occurrence will be increased, if it be found, that while the hernia was confined to the groin, it was always capable of reduction, but that after its descent into the scrotum, though never attended with symptoms of inflammation, or strangulation, it could no longer be returned, at least completely; if it be ascertained, that whenever the swelling became larger, the patient was often annoyed with colic complaints, the termination of which always coincided with the subsidence of the tumour, and was accelerated by the use of aperient medicines and clysters; if the patient should have experienced habitually after digestion, and a little while before going to stool, a sensation of heaviness and dragging in the scrotum; if a depression, proportionate to the size of the hernia, be observable in the right iliac region; and lastly, if the strangulation should appear to have been brought on by intemperance, and an accumulation of ill-digested aliment, rather than by any effort, that has forced an additional portion of bowel into the tumour.

In considering the diagnosis, one or two circumstances, pointed out by my friend Mr. Lawrence, are particularly entitled to attention, as affording a valuable criterion. These descents, says he, must take place gradually; the displacement of parts, connected as the cœcum and colon are in their natural situation, must be a slow process; and, consequently, herniæ formed suddenly by any accidental cause, or violent exertion, cannot be of this kind.*

In this species of hernia, as well as in all others of large size, the symptoms of strangulation are hardly ever violent, either on account of the width of the neck of the hernial sac and abdominal ring, or the relaxation and looseness of the aponeurosis of the external oblique muscle. In every case, it is a matter of the first-rate importance not to confound the symptoms of strangulation with those of colic and irritation, proceeding from the adhesion of the bowels to the hernial sac. When a large old scrotal hernia becomes strangulated, the evacuations from the bowels are always totally suppressed; the swelling is painful; and the patient is affected with vomiting, hiccough, and fever. On the contrary, in the colic from irritation resembling strangulation, the discharge of feces and air from the rectum is never entirely suppressed; and these evacuations are increased when mild purgatives and clysters are exhibited. If nausea, and tendency to vomiting occur, it is at long intervals; strictly speaking, there is no fever; and the swelling, though tense and bulky, is not painful on being handled. Under such circumstances, mildly aperient medicines, repeated clysters, and cold applications to the hernia, may be employed with considerable success, and the surgeon should not be in too much haste to operate.

But, if a hernia of the cœcum, of long standing and great size, were to be really strangulated, so that the only chance of saving the patient's life depended upon the performance of the operation, the surgeon, before undertaking it, should recollect, that the bowels contained in the tumour do not admit of being completely returned into the abdomen, by reason of the particular connections which they have with the hernial sac; and that, in this case, as well as in all scrotal herniæ of large size, the neck of the hernial sac is never the immediate seat of strangulation. If there be no indication of gangrene, says Scarpa, he is to be content with exposing the abdominal ring, which he is to make a slight division of outwards, without cutting the neck of the hernial sac. By means of this simple incision, he will obviate the stricture, without exposing the bowels to the air. Afterwards, he is to endeavour to promote the passage of the feces and wind through the protruded bowels by means of gentle pressure on the swelling, and try to return the viscera, as far as practicable, into the abdomen. If, from inadvertence, from an apprehension of gangrene, or from mistaking the nature of the hernia, the operator should have opened the hernial sac, then the best mode of bringing the operation to a conclusion would be to remove the stricture, return such portion of the bowel as will admit of it, and cover the rest with the sides of the hernial sac and the integuments of the scrotum. The best applications are generally fomentations, and light simple dressings. Under such treatment, the intestine, notwithstanding its adhesions to the hernial sac, will gradually return into the abdomen; and the portion which cannot do so, will granulate, and unite with integuments. There will then remain in the groin merely a tumour, composed of the cul-de-sac of the cœcum, for the keeping of which from all pressure, and from becoming in time larger, the patient must wear during the remainder of his life a truss with a concave pad.

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* On Ruptures, p. 197. edit. 3.

When the hernia is complicated with gangrene, an outlet is to be made for the feces, by a longitudinal division of the gangrenous bowel, care being taken that the stricture itself, if it now require it, be also divided.

CHAP. XXXVII.

HYDROCELE.

Of this disease there are three principal kinds; one, in which the fluid is lodged in the cellular texture of the scrotum; another, in which it is contained in the tunica vaginalis testis; and a third, in which the fluid collects in the spermatic cord.

The first sort, sometimes named *hydrocele œdematodes*, is strictly only an anasarcous tumour of the scrotum, and generally a symptom of a dropsical affection of the whole constitution. The two other kinds are absolutely local, commonly attack one side only, and are frequently found in persons who are perfectly free from all other complaints.

HYDROCELE ŒDEMATODES,

Is a swelling of the scrotum, from a gradual effusion of limpid fluid in the cellular membrane: it is softish and pale-coloured, and, when touched with the finger, the impression continues for some time afterwards. As the disease increases, the part becomes firmer, smoother, and tenser, the corrugations being at length entirely effaced. The neighbouring parts, especially the penis, are generally affected at the same time, and the latter organ is often surprisingly deformed, the prepuce being sometimes so swelled as to obstruct the free discharge of the urine. In the worst stages of the disease, the extreme tension of the skin and cellular membrane brings on inflammation, and sloughing.

The most frequent causes of this species of hydrocele do not differ from those, which are concerned in the production of ascites and œdema in general. The pressure of certain tumours upon the large veins and lymphatics within the abdomen; the accidental rupture of a hydrocele of the tunica vaginalis, or the water of this last disease not having a ready outlet through the puncture in the skin, in consequence of the aperture having changed its situation with respect to the opening in the tunica vaginalis, after the lancet is withdrawn; violent contusions of the scrotum; the pressure of a tight ill-made truss; are all circumstances which may give rise to an œdematous hydrocele. In infants it may be the effect of pressure sustained during delivery, and of the part being exposed to the irritation of the urine.*

In the treatment, it is necessary to remove, if possible, the causes. When the complaint is merely an effect of a dropsical tendency in the whole system, the possibility of a cure will of course depend upon the success with which the general indisposition can be combated. Thus, if ascites cannot be cured, it will be in vain to expect to disperse the dropsical affection of the scrotum. In particular examples, to which I have alluded, hydrocele œdematodes is quite a local disease, and it is then to be treated according to rules, laid down in the chapter on œdema.

HYDROCELE OF THE TUNICA VAGINALIS.

This complaint has generally the appearance of a smooth, oblong, or pyriform swelling of one side of the scrotum.† It is not attended with any discolouration of the skin, and, if carefully watched from the beginning, it is observed at first only at the lower part of the scrotum, whence it gradually spreads upward, until it reaches the higher part of the spermatic cord, on the outside of the ring. Its ordinary shape somewhat resembles that of a swan's-egg pear, with its broad part downwards. In an early stage, it presents a softish feel, attended with fluctuation; but, on the fingers being removed, it immediately rises to its former level. It cannot be diminished either by pressure, or by making the patient lie down upon his back; it cannot be pushed into the cavity of the abdomen; nor can any impulse be distinguished in it, when the patient coughs; circumstances marking its difference from hernia. When the disease is more advanced, and has attained a larger size, the tumour becomes oblong, and its weight and firmness increase, though they are still much less than in sarcocele. At the same time, the fluctuation grows less distinct. If the fluid be clear, the tunica vaginalis and the cremaster not much thickened, and a candle be placed behind the tumour, the scrotum will present a semitransparent appearance. When the quantity of fluid is considerable, the testicle cannot be plainly felt, being distinguishable only at the upper and back part of the tumour, by a certain hard feel. The spermatic cord, however, is still obvious to the touch. Even when the swelling has acquired its greatest size, and the scrotum is considerably distended, the corrugations are seldom so completely obliterated as in the œdematous hydrocele. The penis appears small, and, as it were, buried in the tumour. In old cases, the integuments of the scrotum are sometimes much thickened; the veins large; and, upon handling the swelling, a sense of elasticity, rather than of fluctuation, is communicated. When the hydrocele is of very great size, the spermatic cord itself may be concealed by it, nearly, or quite up to the ring. In children, the water extends higher up the cord, than in adults.*

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* Callisen, Systema Chirurgiæ Hodiernæ, vol. ii. p. 64.

† "Morbus interdum in utroque latere scroti occurrit." Callisen, Syst. Chirurgiæ Hodiernæ, vol. ii. p. 76. Also, Sir Astley Cooper's Lectures, vol. ii. p. 88. A hydrocele of the tunica vaginalis is sometimes accompanied with an encysted hydrocele of the cord, which case is known by the tumours having originated at two different points. There is also a constriction between them; but this is not a sure criterion, as the sac of a common hydrocele is sometimes divided, by a middle contracted part, into two cavities, which, however, communicate. Richerand, Nosographie Chir. t. iv. p. 268. edit. 4.

The quantity of fluid varies in different cases: a hydrocele of ordinary size contains about six, eight, or ten ounces; but instances are recorded, in which four †, and even six ‡ pints of water were drawn off. The largest hydrocele perhaps ever met with, was that of Mr. Gibbon, from which six quarts of fluid were let out by Mr. Cline. § The disease is rather inconvenient, on account of its size and weight, than painful, or dangerous. When large, however, and not supported in a bag-truss, it drags the spermatic cord, and creates pain in the loins. It also interferes with every kind of labour, in which the lower extremities are concerned, and prevents the individual from riding on horseback. Hence, many patients cannot follow the particular avocations on which their livelihood depends, and are compelled to seek a cure. The manner, in which the swelling draws the integuments from the penis, prevents the full erection of that organ; a circumstance, which is frequently a source of great anxiety; because the patient, not understanding the precise nature of the disorder, is apt to suppose his virility irrecoverably impaired. When the swelling is very large, the penis is completely retracted, and the urine, dribbling over the front of the scrotum, may bring on a good deal of inflammation, and even troublesome ulcerations, unless the greatest attention be paid to cleanliness. The transparency of the tumour, its fluctuation, and its freedom from pain, may be regarded as the best criterion of this species of hydrocele.

Sometimes, in certain enlargements of the testicle, there is an appearance of transparency, but it is confined to the lower part of the swelling: this happened in a case noticed by Mr. Cross, in La Charité, at Paris, and was fully accounted for by a small quantity of transparent fluid found in that portion of the tumour, after an operation.* But, as in some cases referred to by Warner no fluid issued from openings made with a lancet, I know not how to explain the cause of the transparency, except by supposing that the punctures had been made where the tunica vaginalis happened to be partially adherent.

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* Hunter, Observations on Certain Parts of the Animal Œconomy, p. 12. edit. 2.

† Wadd's Cases of Diseased Bladder and Testicle, p. 61. 4to. London, 1815.

‡ Earle on Hydrocele.

§ Sir A. Cooper's Lectures, vol. ii. p. 92.

Scarpa, who has carefully examined hydroceles in the dead subject, assures us, that, whenever the tumour is large, the spermatic vessels are found so displaced and separated, that the artery and vas deferens usually lie on one side of the swelling, and the veins on the other; and that sometimes all these different vessels extend from the sides towards the front of the tumour, chiefly at its lower part. In treating of hydrocele of the tunica vaginalis, many writers of great eminence have been entirely silent respecting the cremaster muscle, though it has an intimate connection with the disease, the collection of water being, in reality, contained in a double sac, formed of the muscular sheath and aponeurosis of the cremaster, and of the tunica vaginalis. In large, old hydroceles, the exterior of these investments acquires considerable strength and thickness, while the tunica vaginalis itself mostly remains in its natural state. In the operation, the surgeon should be well apprised, that he has to pierce a sac formed of two separate layers, very different in their structure, and capable of slipping, as it were, over each other.†

Here it is but justice to remark, that the animadversion of Scarpa, respecting the silence of writers about the intimate connection which the cremaster muscle has with hydrocele, should not be extended to several English authors, who have been very careful to notice this important circumstance. In a hydrocele, as well as a rupture, the cremaster, says Mr. Hunter, "becomes stronger than usual, and its fibres can be traced spreading on the tunica vaginalis, and seem at last to be lost upon it near to the lower end of the body of the testicle."‡ The expansion of the cremaster over the tunica vaginalis in hydrocele, is also particularly noticed both by Warner§ and Mr. C. Bell.‖

A hydrocele should be carefully distinguished from a hernia, which it may always readily be, by adverting to those differences which have been already pointed out; particularly, to the absence of all impulse in the tumour when the patient coughs, the unchanged size of the swelling in every position of the body, and the quiet undisturbed state of the intestinal canal.¶

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* See Cross's Sketches of the Medical Schools of Paris, p.140, 141. 8vo. Lond. 1815.

† Scarpa, Traité Pratique des Hernies, pp.64—51.

‡ Obs. on Certain Parts of the Animal Œconomy, p. 6. edit. 2.

§ Cases in Surgery, p.288. edit. 4.

‖ Operative Surgery, vol. i. p.194. 8vo. Lond. 1807.

¶ A hernia and hydrocele of the tunica vaginalis may exist together; a complication known by considering the symptoms peculiar to each affection. In cases

Fungus hæmatodes testis is more liable, than any other disease, to be mistaken for hydrocele; for the swelling is so elastic, and the feel which it communicates so like that of a fluid, that many surgeons of great experience have been deceived, and actually introduced a trocar into the tumour.

A hydrocele may be discriminated from a common sarcocele, or scirrhous testicle, by being compressible, indolent, and much lighter than if the substance of the swelling were of a fleshy nature. At the same time, it is even and uniform, and accompanied with a fluctuation that is always sufficiently obvious, except when the great tension of the swelling communicates rather the feel of simple elasticity, than that of the positive presence of a fluid. On the contrary, a scirrhous testicle is an indurated, heavy, irregular, painful tumour, unattended either with fluctuation or transparency; it is flatter at its sides than a hydrocele; the patient often has an unhealthy look; and the pain in the loins is considerable.

With regard to the causes of hydrocele, it is a subject, about which little is known. Sir Astley Cooper states, that the absorbent vessels of the spermatic cord are much enlarged in hydrocele, and he adopts the opinion, that the disease consists rather in increased secretion, than diminished absorption.* In general, the complaint appears to originate spontaneously; but it has been sometimes observed to follow a bruise, or the friction which the scrotum suffers in hard riding; and, if any faith can be put in the conjectures of the late Mr. Ramsden, it would appear, that the origin of this disease is sometimes owing to an irritable state of urethra.† The pressure of ill-constructed trusses on the spermatic cord, is alleged to be sometimes the cause of the disease. Hitherto, I am afraid, it cannot be truly said, that our surmises, respecting the causes of hydrocele, have afforded any material light in the investigation of the treatment. Fortunately, this imperfection in our knowledge is not of much practical consequence, as the surgeon is only anxious to have a safe and certain method of cure, and this he already possesses. The complaint frequently affects the most healthy and robust, and young subjects as well as old ones: it has no connection with a general dropsical habit or debility; and it is generally, perhaps always, quite a local affection.

The prognosis chiefly depends upon the state of the testicle and of the patient's health; for, when this is good, the collection of fluid in the tunica vaginalis is to be regarded as a simple complaint, rather attended with inconvenience than risk: though, if the statements of some writers be correct, the long-continued pressure of

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of strangulated bubonocele, accompanied with such a hydrocele, the operation for the hernia may prove a cure of the other disease, by accidentally exciting inflammation and sloughing of the distended tunica vaginalis. See a case to this purport related by Flajani, Collezione d'Osservazioni, &c. t. ii.

* Sir A. Cooper, Lectures, vol. ii. p. 93.

† See Practical Ob. on Sclerocele, &c. p. 198—201.

the water upon the testis, when the swelling is of very considerable size, may induce an atrophy of that organ. When, however, the effusion of fluid in the tunica vaginalis is the consequence of a disease of the testis, constituting a hydro-sarcocele, the prognosis is unfavourable, because the hydrocele cannot be cured, unless the testis either admit of being restored to its natural state, or of being removed by an operation. With a very few exceptions, if the surgeon, in the case of a hydro-sarcocele, were to aim only at removing the fluid, it would have the bad effect of exasperating the other more serious disease, in a degree that might render every future measure unavailing. In general, when a hydrocele is left to itself in adult subjects, no cure can be effected by nature alone, the examples of a natural cure, from accidental inflammation and sloughing of the scrotum, being very rare; but, when properly treated, it may almost always be removed both with safety and certainty. In young persons, the cure is still easier; and, in children under seven years of age, nature, without any assistance, not unfrequently disperses the complaint.* Sometimes the tumour is so tense, that it bursts, or it is ruptured by external violence, or from an accidental effort of the patient, and the fluid is effused in the cellular membrane of the scrotum. Accidents of this kind sometimes terminate in a radical cure. There are two methods of treatment, one called *palliative*, the other *radical.*

PALLIATIVE TREATMENT.

This consists in puncturing the tumour with a lancet, or small trocar, for the purpose of merely discharging the fluid. When the patient's state of health forbids the radical treatment, which though mild, is attended in some constitutions with risk; when his timidity interferes with it, or it is inconvenient for him to undergo the requisite confinement, the simple tapping of the hydrocele may be all that can be attempted. For the performance of it, the trocar should generally be preferred, as the cannula facilitates the escape of the water, and prevents its diffusing itself in the cellular texture of the scrotum. When, however, the hydrocele is small, or the nature of the disease is at all doubtful, a lancet ought to be used, as an opening can be more cautiously made with it than with a trocar, the sudden introduction of which might injure the testicle. This precept deserves attention, because there are surgeons who think, that the fluid of a hydrocele should be let out as soon as a puncture can be made with security; alleging, as a reason for the practice, the greater probability of the absorbents being able to resume their functions, and complete the cure while the disease is recent, and the tunica vaginalis unthickened, than at a later period.†

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* Sir A. Cooper, Lectures, vol. ii. p. 97.

† See Wadd's Cases of Diseased Bladder and Testicle, p. 54. 4to. Lond. 1815, in which work a hydrocele is mentioned, that was let out with a trocar, at

When a hydrocele is large, the palliative treatment ought first to be practised, and the radical cure not undertaken till the tumour has acquired again about two-thirds of its former magnitude. The reason of this advice is founded on what experience had taught the late Sir J. Earle, viz. that when the radical treatment is applied at once to a large tense hydrocele, the inflammatory symptoms often run to an unnecessary height. As hydroceles are not unfrequently complicated with disease of the testicle and spermatic cord, and the exact state of these parts, especially of the testicle, cannot always be determined, while the tunica vaginalis is considerably distended, the surgeon sometimes finds it necessary to let out the fluid, in order to ascertain whether the case be a simple hydrocele or not. In fact, until all doubt be removed concerning the sound state of the testicle, the practitioner cannot know what further proceeding should be adopted; that is, whether the case ought to be treated as a common hydrocele, or as a hydro-sarcocele, in which latter disease, the means customarily adopted for the radical cure of the other affection, would be inapplicable and hazardous.*

With whatever intention the operation is undertaken, the surgeon should be sure of the presence of fluid before the puncture is made; or, at all events, if a degree of doubt cannot be dispelled, a small opening should be carefully made with a lancet into the tunica vaginalis. When this has been done, and the disease is found to be not a simple hydrocele, but a thoroughly diseased testicle, (for instance, a fungus hæmatodes), the surgeon should perform castration without further delay.

In a common hydrocele, the best place for the puncture is at the anterior and lower part of the tumour, the spot which is most remote from the testicle. At the same time, if the swelling be large, we are not to be unmindful of the possibility of the spermatic vessels lying over the sides, or even over the front of the lower part of the sac, and the cautions, which Scarpa has offered on this subject, are highly valuable. The patient is to stand before the surgeon, who sits down, and grasps the scrotum with his left hand, so as to make the fluid bulge forwards, and the swelling tense. The trocar must not be introduced to an unnecessary depth, lest the testicle be injured; a danger which will also be more certainly avoided, if the point of the instrument be directed obliquely upward, and not too much backward.† In order to hinder the trocar from penetrating too deeply, the thumb may be placed upon the instrument, about half or three quarters of an inch from its point.

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the end of a fortnight, and did not return. Mr. Pott speaks of two similar cases; and, says Mr. Wadd, a patient of mine, lately showed me a hydrocele, which contained half a pint of fluid, attributed to a blow he received on the testicle five weeks before. It was evacuated with a lancet, and has not returned since.

[*] See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 154. 8vo. Weimar, 1794.

[†] C. Bell's Operative Surgery, vol. i. p. 199.

As soon as the stilette has entered the tunica vaginalis, it need be pushed no further, for it has done its office; on the contrary, the surgeon is now to withdraw it, and at the same instant, push the cannula alone further into the cavity of the tunica vaginalis. The necessity of the cannula being well introduced, arises from the collapse of the preceding membrane, when the fluid escapes, and its consequent tendency to slip off the extremity of the tube, whereby the completion of the operation might be interrupted.

In the hydroceles of children, the testicle generally occupies a lower situation than in those of grown-up persons, and the swelling extends higher up the cord, owing to the cavity of the tunica vaginalis naturally reaching further in that direction. Hence, in tapping the hydrocele of a child, (which, however, is hardly ever necessary,) the surgeon should introduce the trocar somewhat higher up, than the place usually chosen in adults, and direct the instrument rather less obliquely backwards. * After the fluid is all discharged, the cannula is to be withdrawn, a small piece of soap plaster put over the puncture, and a bag-truss applied.

Such is the palliative operation, which commonly produces only a temporary removal of the swelling, as the water afterwards collects again, and the patient relapses into his former state. Hence, unless the same method be repeated from time to time, or the radical treatment adopted, the patient soon experiences all the inconveniences of the complaint again. The re-accumulation of the fluid is generally gradual, but cases have happened, in which the water collected again to its former quantity, as early as three or four hours after the operation. In one example of this kind, Flajani repeated the puncture next morning, and let out more than a pint of turbid dense fluid, and the disease did not return. † However, when the tumour forms thus suddenly again, it is almost always from an extravasation of the blood, constituting the disease termed *hæmatocele.* In a limited proportion of cases, the operation of simply tapping a hydrocele, and letting out the fluid, is unexpectedly followed by a permanent cure. ‡ This apparently trifling operation may have a fatal result, in consequence of its bringing on violent inflammation and sloughing of the scrotum.*

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* Richerand, Nosographie Chir. tom. iv. p. 245. edit. 2.

† See Collezione d'Osservazioni e Riflessioni di Chirurgia di Giuseppe Flajani, t. ii. p. 164. 8vo. Roma, 1800.

‡ See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 158. A permanent cure may follow the simple tapping of the tumour, when a largish trocar or lancet has been used; when the cannula has rubbed against the testis; when the patient will not afterwards keep himself quiet (Flajani, vol. cit. p. 183.); neglects to wear a bag-truss; or is of a very irritable habit. In young persons, a radical cure has been the consequence of wetting the scrotum with lime-water after tapping. (Ib. page 182.) Cases, which were hydro-sarcoceles and tapped, have sometimes terminated in a gradual disappearance of the fluid that collected again on the testis regaining a healthy state. (Flajani, t. ii. p. 181.) If, says Bertrandi, though the puncture has been made according to all the rules of art, and without any fault, the scrotum should inflame and suppurate, a longitudinal incision must be made to let the matter have a free exit, and thus a hydrocele, to which it was intended to apply only the palliative treatment, is perfectly cured without the chance of relapse. Traité des Operations, p. 189.

RADICAL CURE.

This is sometimes, though not very often, in adult subjects, effected by means of external applications to the scrotum; it may be more certainly accomplished by letting out the fluid, and either cutting away the loose part of the sac, or exciting such a degree of inflammation in the tunica vaginalis and testicle, as leads to an universal adhesion of the inner surface of this membrane to the tunica albuginea, and, consequently, to a complete obliteration of that cavity in which the water is collected. Without such obliteration, it has been generally supposed, that the relief would always be only temporary. This is an opinion, however, which has of late years been rendered questionable by the observations of Mr. Ramsden†, Mr. Wadd‡, and Mr. Kinder Wood.§ The latter gentleman finds, that, if the tumour be punctured with an abscess lancet, and a little bit of the sac be drawn out with a hook, and cut off, a very mild inflammation of the cavity follows, unattended with confinement or general indisposition, and frequently ending in a radical cure, *though no obliteration of the cavity of the tunica vaginalis be produced.* The correctness of this statement, Mr. Wood conceives, is further corroborated by a reference to cases, in which a radical cure is brought about by discutient applications. These sentiments, however, stand in need of confirmation by dissection; for not only might the foregoing writer be deceived in the judgment which he formed from the external feel of the scrotum, that no adhesion had taken place between the tunica vaginalis and tunica albuginea, but also with respect to another opinion, viz. that when a hydrocele is cured by external applications, no such adhesion takes place. In one patient, who died some time after he had been cured of a hydrocele by the lotion of a muriate of ammonia, Mr. Keate assures us, that the tunica vaginalis was found closely adherent at every point to the tunica albuginea.|| The late Mr. Ramsden principally founded his theory upon the well-known fact, that the scrotum sometimes becomes transparent after the operation, whence he inferred, that another collection of fluid must be effused, which is subsequently removed without obliteration of the cavity of the tunica vaginalis.

That, in many instances, a considerable effusion of serum and coagulable lymph takes place within the tunica vaginalis, after the use of an injection, is a truth, which will be readily admitted by

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* Sir Astley Cooper's Lectures, vol. ii. p. 99.

† Practical Obs. on Sclerocele, &c. 8vo.

‡ Cases of Diseased Bladder and Testicle, p. 51., &c. 4to. Lond. 1815.

§ Medico-Chir. Trans. vol. ix. p. 58, &c.

|| See Keate's Cases of Hydrocele, &c. p. 59.

every man of experience. That such effusion may produce an appearance of transparency, and even a fluctuation, leading to an idea that the disease has returned, and the operation miscarried, is also equally certain. But it does not follow from these premises, that, when the tumour is afterwards lessened by the action of the absorbents, the cavity of the tunica vaginalis will remain; an inference, which ought not to be assumed, without the evidence of dissection. As Richerand has observed, " the radical cure of a hydrocele is not always effected by means of an adhesion *immediately* formed between the tunica vaginalis and the surface of the testicle. In most instances things do not happen in this manner. The irritation produced occasions an exudation of a lymphatic albuminous matter, which becoming organized betwixt the two surfaces, unites them together. This matter, which is very different from pus, is often so copious as to cause a fluctuation, and make an inexperienced surgeon believe a new effusion of water has happened within the tunica vaginalis, and that the operation has failed. In patients who have died under these circumstances, the tunica vaginalis has been found distended with flakes of albumen, which, concreting and becoming organized, forms the adhesion between the tunica vaginalis and the testicle." * These remarks are adduced, however, not with any intention of denying the possibility of radically curing a hydrocele, without obliterating the cavity of the tunica vaginalis †; but only to prove, that some of the circumstances, brought forward as evidence of the cure being thus accomplished, when the hydrocele has been injected, are by no means conclusive. When a spontaneous cure takes place in a child, I suppose there is usually no obliteration of the cavity in which the fluid was collected; and, probably, no such change happens when the disease is removed by external applications, unless they chance to excite inflammation.

EXTERNAL APPLICATIONS.

That hydroceles might occasionally be cured by means of discutient applications, was a fact not unknown to the ancients. The plan is recommended by Ætius; and Wiseman ‡, the father of English surgery, even adduces cases in proof of its success. That it would sometimes answer might, indeed, have been anticipated from the consideration of another circumstance, adverted to by the late Mr. Keate, viz. " our frequently seeing collections of water in the tunica vaginalis disappear in consequence of some accidental cause, as a blow, the gout, fever," &c.* The treatment, tried by this gentleman, simply consisted in applying to the tumour, three times a day, linen wet with a lotion composed of an ounce of the muriate of ammonia, dissolved in four ounces of vinegar, and a similar quantity of spirit of wine. The swelling was also supported in a bag-truss. In children, hydroceles often get well of themselves, or yield to discutient applications. Hence, in such patients, as Mr. Wadd has remarked, it is seldom necessary to resort to an operation.† I am happy to be able to corroborate this statement by the testimony of a gentleman, whose experience in the diseases of children has been for some years very extensive: I mean Mr. M'Gregor, surgeon to the Lock Hospital and York Military Asylum, who has had abundant opportunity of ascertaining the fact, that, in young subjects with hydrocele, there is seldom any real occasion for an operation, as the disease may be got rid of by any local remedies, calculated to excite the action of the absorbents. In his own practice, he has found fumigations of the scrotum with cinnabar one of the most efficient means. A boy, twelve years old, was cured of a hydrocele, by exposing the swelling to the steam of vinegar, applying the lotio plumbi acetatis, and exhibiting purgatives.‡ Successful as this practice appears to be in children, it is very uncertain in adults; and though, in them, it is sometimes found to answer, it more frequently fails. In a part of the cases, brought forward by Mr. Keate in favour of the method, the lotion was applied as soon as the water had been discharged; and when this mode is followed, I believe a cure is more likely to be the result, than when the swelling is not emptied; at all events, there is a case or two in the writings of Flajani §, tending to prove the truth of this remark. A hydrocele, which was apparently the consequence of the pressure of an ill-made truss on the spermatic cord, was cured by taking off the truss, and using resolvent lotions, and a suspensory bandage.|| I know of no particular objection to a trial of external applications, except their frequent inefficacy in adult patients. Candour obliges me to add, however, that, in one or two instances, which have been verbally communicated to me, the patient not only lost time in the experiment, but suffered a good deal of pain from superficial inflammation of the scrotum, excited

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* Richerand, Nosographie Chir. t. iv. pp. 284, 285. edit. 4.

† In one case, cured by injection, and dissected some years afterwards, the adhesions were only partial, and the rest of the tunica vaginalis was more relaxed than natural; so that Sir A. Cooper concluded, that the action of the vessels had only been changed. Lectures, vol. ii. p. 109.

‡ Wiseman, b. i. chap. 23.

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* See Keate's Cases of Hydrocele, with Observations on a peculiar Method of treating that Disease; to which is subjoined a singular case of hernia vesicæ urinariæ, complicated with hydrocele, &c. p. 19. 8vo. Lond. 1788.

† Wadd's Cases of Diseased Bladder and Testicle, p. 54.; also, Sir A. Cooper's Lectures, vol. ii. p. 96.

‡ Richter, Chir. Bibliothek. b. ix. p. 593. Sir A. Cooper, in cases of children, directs a little calomel and rhubarb occasionally, and orders a suspensory bandage, which is kept wet with liq. ammon. acet. in every six ounces of which two drachms of muriate of ammonia are dissolved. See Lectures, vol. ii. p. 96.

§ In one young man, twenty-two years of age, a hydrocele was radically cured by simply puncturing it, and covering the scrotum with a compress dipped in lime-water. See Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. p. 182. The practice is sanctioned by Sir A. Cooper, Lectures, vol. ii. p. 98.

|| See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 168, 169.

by the muriate of ammonia; an occasional inconvenience, of which, indeed, Mr. Keate himself makes mention. *

EXCISION OF THE SAC,

Which was always followed by considerable inflammation and fever, and sometimes by fatal effects†, is at present entirely rejected from the practice of surgery in England. When the tunica vaginalis is much thickened, a few foreign practitioners yet deem its excision necessary; but, in this country, impartial experience at length declares against the necessity of the proceeding, even in such a case, and an ossified state of that membrane is the only condition now allowed to require so severe a method. Specimens of such ossifications are contained in Mr. C. Bell's Museum‡, and the collection at Guy's Hospital.§ Though an unqualified condemnation of the practice of excision, as it was formerly executed, is now the general sentiment, I would not wish the remark to apply to Mr. Kinder Wood's method, which has been already spoken of, and which, from the reports made to me about it, I am inclined to think, is both mild and effectual.

SETON.

The tumour is to be pierced, and the fluid discharged through the cannula in the common way. A seton-cannula is then to be passed through that of the trocar, until it reaches the upper part of the tunica vaginalis. This having been done, a sharp-pointed eye-probe, armed with a seton, is to be conveyed through the seton-cannula, and pushed from within outwards through that portion of the tunica vaginalis and integuments, with which the extremity of the tube is in contact. The seton is then to be drawn through the instrument, until a sufficient quantity is brought out of the upper wound. The two cannulæ are next to be withdrawn, and common dressings applied to the orifices of the punctures, the ends of the seton being fixed, as may be found most convenient, with a couple of slips of adhesive plaster. A bag-truss is to be applied, the

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* In addition to the above observations, tending to prove the possibility of dispersing hydroceles, especially in young subjects, the following facts merit notice. Morand dispersed several hydroceles by making an issue in the scrotum. Douglas did the same thing by means of an issue near the groin. Schmucker cured one hydrocele by applying the steam of vinegar night and morning, and the same fluid as a lotion at other times. Warner often cured hydroceles in children by means of purgatives and outward applications. (Cases in Surgery, p. 302. edit. 4.) Mohrenheim cured a hydrocele in a similar manner. In children the disease has yielded to emetics; (Richter, Chir. Bibliothek. b. v. p. 120.) to mercury; (Dussaussoy.) to an attack of gout. (Pott.) Richter suggests the external application of tartar emetic. Anfangsgr. b. vi. p. 65.

† See Warner's Cases in Surgery, p. 301. edit. 4.

‡ Operative Surgery, vol. i. p. 207. 8vo. Lond. 1807.

§ Sir A. Cooper, Lectures, vol. ii. p. 93.

patient go to bed, and take an opiate draught. Of all the methods, devised for the cure of hydrocele, none are more ingenious and effectual than the seton, and next to the treatment with an injection, it is unquestionably the mildest plan, and most deserving of recommendation. When the disease resists discutient applications in young subjects, Sir Astley Cooper passes a curved needle and thread transversely through the hydrocele, then ties the thread, cuts off the needle, and lets the child run about, till the scrotum inflames, which usually happens in about a week, at which period, the seton is withdrawn, and the adhesive inflammation completes the cure.*

CAUSTIC.

When this practice used to prevail, caustic potassa with quick-lime, was mostly employed, with which an eschar, about half an inch broad, was made along the whole front of the tumour. The treatment of hydrocele with caustic may at present be considered as entirely exploded; for, when the eschar separates, the opening seldom extends into the tunica vaginalis, and a cutting instrument must after all be used for discharging the fluid. On the whole, this plan is far more painful, and uncertain in its effect, than several of the other methods.

INCISION.

This is a method which has had several distinguished modern surgeons amongst its advocates, as the names of Richter†, Loder‡, and Callisen§, will amply testify; and it is one of the most ancient modes of cure, having been described by Celsus. The anterior and inferior part of the tumour is to have a puncture made in it, of sufficient size to enable the operator to introduce the end of his fore-finger into the cavity of the tunica vaginalis. This he should do immediately, and before all the fluid is discharged, and the tunica vaginalis collapses. Then, with a blunt-pointed curved bistoury, the tunica vaginalis is to be divided throughout its whole length. The wound is then to be gently dressed with lint and a common pledget. The reasons commonly urged in favour of this operation are, that it allows the operator to see the state of the tunica vaginalis and testicle, so that he is perfectly qualified to judge whether they require removal or not. But I have already stated, with respect to the thickening of the tunica vaginalis, that, according to the observations of Sir J. Earle, Mr. C. Bell, and others, it will not impede the cure of a hydrocele, though no excision of the diseased membrane be practised. Laying open the tumour, therefore, cannot be deemed necessary for any purpose of this kind: and, as for the supposed advantage of seeing the state of the testicle, every useful information on this point may be obtained by the feel of the part, after the fluid is let out by a simple puncture. In old large hydroceles, where the vessels of the spermatic cord are separated, and displaced over the fore-part of the bottom of the tumour, an extensive cut through the whole length of the tunica vaginalis must be anatomically objectionable. The severity of the operation, compared either with the cure by means of a seton, or of an injection, is also unfortunately made amends for by no evident advantage, for both the latter methods scarcely ever fail. When the cure by incision is practised, the symptoms sometimes run very high, as we may convince ourselves of, by referring to a case treated in this manner by Flajani, where violent inflammation of the scrotum, fever, general swelling and tension of the belly, and delirium, very nearly carried off the patient.*

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* Lectures, vol. ii. p. 110.

† Medicinische und Chirurgisch Bemerkungen, b. i. p. 119.

‡ Loder, Chirurgisch-Medicinische Beobachtungen, p. 148. 8vo. Weimar, 1795.

§ Callisen, Syst. Chir. Hodiernæ, t. ii.

TENT.

The way of effecting a radical cure of a hydrocele with a tent, consisted in making an opening into the upper and anterior part of the scrotum with a small lancet, and discharging the water. A roll of linen, or a piece of bougie, was then introduced through the wound into the tunica vaginalis, where its irritation produced inflammation, suppuration, and ultimately an obliteration of the cavity in which the fluid was collected. As this process of cure is liable to do more injury to the testis than is necessary, and more painful and troublesome than the employment of a seton or an injection, it is at present universally abandoned.

INJECTION.

The hydrocele is to be tapped with a trocar at its anterior and inferior part, and as soon as the fluid is entirely discharged, and the testicle is felt to be free from the solid and craggy hardness which is indicative of scirrhus, the cavity of the tunica vaginalis is to be distended to its former dimensions with an injection composed of two parts of port wine and one of water. For patients of very irritable constitutions, however, the wine should be more diluted. In speaking of the palliative cure, I took the opportunity of reminding the surgeon of the collapse of the tunica vaginalis, in proportion as the water runs out of it; a circumstance which makes that membrane apt to recede from the cannula, if it be not at first introduced well within it, and held so during the escape of the fluid. When once the tube slips out, it can seldom be passed in again, owing to the aperture in the tunica vaginalis not remaining exactly opposite the puncture in the scrotum; and, for the same reason, the water, instead of readily flowing out, is liable to insinuate itself into the cellular membrane, and a more or less complete interruption of the operation ensues. But when the cannula slips out of the tunica vaginalis, at the time of attempting the radical cure with an injection, the consequences are far more serious; for if the tube cannot be replaced again, the operation must be deferred until the swelling has filled again; or, if the displacement of the cannula unfortunately be not perceived, and the injection be forced, not a drop of it will pass into the cavity of the tunica vaginalis, but the whole will be thrown into the loose cellular texture of the scrotum. Several surgeons of eminence have been known to commit this serious mistake, the general consequences of which are, sloughing of the cellular membrane, tedious and troublesome abscesses, and violent inflammation and sometimes mortification of all the integuments of the scrotum, and death.* When it is considered, that the accident produces a great deal of severe pain and fever, and much uncertainty, whether the patient, after all this suffering, will be rewarded by a permanent cure of the hydrocele, the mistake cannot fail to be regarded as one of a most vexatious nature. It was from such a cause, that the whole tunica vaginalis sloughed, with part of the scrotum, in a patient operated upon by Boyer.† Another instance is mentioned by Sir J. Earle, in which the surgeon, after letting the tube slip from the tunica vaginalis, continued to force the injection, until he actually filled both sides of the scrotum. Violent inflammation and mortification of the scrotum were the consequences, leaving the testes quite bare. A very similar mistake happened in a case, where I was desired to assist in the operation. These remarks are calculated to impress upon the mind of the surgical reader the necessity of always being sure, that the cannula is well within the tunica vaginalis, before the injection is used, and, in the beginning, the surgeon should proceed in the gentlest and most cautious manner, attentively observing whether any resistance to the entrance of the fluid be experienced, and whether any of it regurgitate in the early stage of this part of the operation. If such resistance to the admission of the fluid be perceived, immediately followed by a return of the liquid outward, these things must either be owing to the end of the tube resting against the testis, or to its having slipped altogether out of the cavity of the tunica vaginalis. Shifting the position of the tube will at once prove, whether the difficulty be owing to the former cause; for if it be, the injection will now readily enter, without the least occasion for force. But, on the contrary, if the obstruction be not removed by altering the position of the cannula, the practitioner has strong cause for suspecting, either that the tunica vaginalis, in collapsing, has slipped away from the tube, or that the latter has been inadvertently drawn more or less out of the scrotum. He must, therefore, not persist in forcing the injection into the part, but endeavour gently to push the tube into the cavity of the tunica vaginalis again, and if this cannot be effected, the attempt at a radical cure should be postponed, because in the empty state of the hydrocele, another puncture with the trocar manifestly cannot be made with due regard to the safety of the testicle. In the case, which fell under my observation, the mistake was not discovered until it was wished to let out the injection again, when it was found, that only the few drops, which happened to be in the tube itself, could be discharged. This was one of the most copious extravasations of injection I have ever witnessed. A good deal of sloughing of the cellular texture of the scrotum followed, with suppuration, the matter descending far along the perinæum. The skin, however, did not mortify, which might be owing to the injection being only one-half of it wine. A radical cure was the result. The mistake must be very frequent; for there are hardly any of my surgical friends in London, who have not witnessed it on one or more occasions; and the occurrence is mentioned by nearly every writer. "This is an accident," says Mr. C. Bell, "which I have seen very frequently happen in the hands of dexterous surgeons. One day, while I was accompanying a celebrated surgeon to the house of a patient, on whom he was about to perform this operation, I took occasion to remark to him this danger. He said, that he could not conceive how it should happen, and that he had performed the operation thirty times, without such an accident having occurred. But, in performing the operation that day, the very thing happened: a large proportion of the fluid got into the cellular membrane." *

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* Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. pp. 160, 161.

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* See Case in Sir A. Cooper's Lectures, vol. ii. p. 107.

† Richerand, Nosographie Chirurgicale, t. iv. p. 284. edit. 4.

In order to avoid the foregoing accident, the most important point is to be careful to push the cannula of the trocar a full inch or more into the cavity of the tunica vaginalis at the moment of withdrawing the stilette, which can always be done during the distended state of that membrane with the utmost facility. The tube being once properly introduced, the surgeon should hold it steadily within the part himself, and not entrust it to the assistant, the very act of transferring it from one person to another being attended with some risk of displacing it.

Sir Astley Cooper never throws in so much injection as the fluid that has been let out, but he moves the tunica vaginalis about, so that the whole of its inner surface may come into contact with the injection. If a great quantity of the latter be introduced, the contraction of the cremaster often forces some of it, by the side of the tube, into the cellular membrane.†

In ordinary cases, the port-wine injection is to remain in the sac about five minutes, after which, it is to be allowed to escape through the cannula; but where the constitution is known to be

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* Operative Surgery, vol. i. p. 201.

† Lectures, vol. ii. p. 104.

very irritable, or the pain in the scrotum, groin, and back, arising from the effects of the presence of the stimulating fluid, are unusually severe, half the time above specified will be sufficient.* The public are much indebted to the late Sir James Earle, for the perfection, to which the mode of curing hydroceles by an injection is now brought. His apparatus was remarkably well made. The stimulating fluid was injected into the tunica vaginalis through a pipe, one end of which was made to fit the cannula of the trocar; the other, adapted to receive the neck of an elastic bottle, with a valve, or ball, in the centre of the pipe, to permit the entrance, and prevent the exit of the injection. The latter contrivance was found infinitely more convenient than a stop-cock, which required a hand to turn it.

After the injection has remained long enough in the sac, it is to be let out, particular caution being used to void the whole of it, as the continuance of a part of it behind would cause excessive irritation of the testis and tunica vaginalis, and perhaps it might even ooze into the cellular membrane, and excite inflammation, suppuration, and gangrene. After the operation, a piece of soap-plaster is to be applied to the puncture, and a bag-truss to the scrotum. The following morning a good deal of inflammation has generally ensued, in which circumstance the employment of poultices should commence. When the redness, pain, and swelling of the parts have a tendency to exceed the necessary degree, they must be counteracted by antiphlogistic remedies.

The cure of hydroceles by an injection, is that which is now generally preferred, as being the mildest plan, and hardly ever failing. A few instances, however, have been published, in which this method of treatment has been followed by very severe inflammation of the scrotum, abscesses, and dangerous constitutional disturbance. Nay, great irritation and a locked jaw are said to have been occasioned by the injection in one patient, whose health was previously bad, and who had, a little while before the operation, gone through a course of mercury.† That severe effects will now and then happen under the best management, must be expected by every surgeon who knows the facility with which extraordinary affections of the system, and high degrees of inflammation, are produced in irritable depraved constitutions. Nor would these evils be at all avoided by having recourse to any of the other means of effecting a radical cure, since general experience declares this to be the mildest.* Amongst others, Professor Schreger has detailed an example, in which very severe symptoms and large abscesses in the scrotum followed the injection of a hydrocele. But without dwelling upon the possibility of some of the injection having been extravasated in this case, it may be right to observe, that the constitution of the patient, here alluded to, is acknowledged to have been before the operation in a very bad state, from the effects of syphilis and its treatment. Also, after the fluid had been let out, the testis and cord were found enlarged and indurated; and (what especially claims notice) the injection consisted of two ounces of undiluted Burgundy-wine, which were kept in the tunica vaginalis some minutes, but how many is not specified.†

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* The sensibility evinced by the patient, is the principal circumstance by which the strength of the injection, and the duration of its application, are usually regulated. Thus, if no pain be felt, though the stimulating liquid has been kept in the sac eight or ten minutes, Richter thinks it best to let out the injection, and throw in pure wine. However, no dependence can be put upon the degree of pain experienced; and those, who suffer most during the presence of the injection in the scrotum, often have the least inflammation. See Sir A. Cooper's Lectures, vol. ii. p. 104. Undiluted wine is also recommended when the hydrocele is old, has often been tapped, and the tunica vaginalis is thickened. Anfangsgr. der Wundarzn. b. vi. pp. 98, 99. 8vo. Gott. 1802.

† See Wadd's Cases of Diseased Bladder and Testicle, p. 57.

In a patient, whose extraordinary irritability of constitution is known before-hand, it is always advisable to distend the tunica vaginalis with a much weaker injection than what is commonly used. That hydroceles have been cured by simply letting out the water, and then filling the cavity with air, which was pressed out again, is a fact that has been familiarly known for a long while in this country. But, whether the experiment was given up on account of its uncertainty, or for other reasons, I know not. It is curious to hear, however, that this method of injecting air has been proposed and practised in Germany, as particularly eligible in cases, where it is desirable that the irritation should be very moderate.‡ In the examples, however, published by the author referred to below, it is clear enough, (as indeed, he himself confesses,) that the cure could not be fairly ascribed altogether to the introduction of the air; for a small tent was passed into the opening, and as the inflation was repeated, this little tent was taken out and reapplied as often as it became necessary to use the air-pipe: such proceedings could not fail to excite inflammation of the parts. The chief argument, urged in favour of the plan, is, that, in no other method can the inflammation be so gradually and gently increased according as circumstances may require; an advantage in weak irritable constitutions.

I have heard of hydroceles being cured by injecting the sac with the same fluid that had been let out; and Mr. M'Gregor informed me of three hydroceles, which Mr. Briggs radically cured by merely distending the sac with cold water. These facts, and the effect of simple inflation, are interesting, as delicate patients are sometimes met with, in whom it is desirable to accomplish a cure with as little irritation as possible.

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* Loder, who was in England, and studied under Pott, is very partial to the method of cure by incision: yet he acknowledges that the treatment with injection deserves recommendation in irritable subjects, and that it is safe enough when the hydrocele is simple and uncombined with hardness of the testicle. See his Chirurgisch-Medicinische Beobachtungen, p. 159.

† See Schreger's Chirurgische Versuche, b. i. p. 141—148.

‡ Ibid. p. 132. Ueber Heilung der Hydrocele durch Lufteinblasen.

CONGENITAL HYDROCELE.

Sometimes, a good deal of fluid accumulates within the tunica vaginalis, while the communication between the abdomen and the cavity of that membrane remains unclosed. This case is commonly named a *congenital hydrocele.* The swelling, which is of an oblong shape, is more or less considerable and tense, according as the patient is in the erect or recumbent posture. As the testis is concealed by the fluid, it cannot be plainly felt; but the spermatic cord can usually be perceived behind, and a little towards the outer side of the upper part of the tumour. When the swelling is compressed, it subsides, because the fluid then passes up into the abdomen. Sometimes, however, when the upper part of the sac is much contracted, the pressure must be applied with skill, and continued a good while before this change can be produced. According to the investigations of Professor Schreger, it appears also, that in some individuals, the occasional difficulty in pressing the fluid up into the abdomen, depends upon the direction and conformation of the neck of the sac, and not merely upon its small diameter. In one case, he found that the fluid could be compressed into the abdomen only when the tumour was inclined in a more oblique direction from within outwards; and, on dissection, it appeared that the perpendicular position of the swelling regularly occasioned an angle or sudden turn in the passage.* The earliest account of this species of hydrocele was drawn up by M. Viguerie, a surgeon at Toulouse, and communicated to the Academy of Surgery at Paris. If Schreger's statements be correct, it is a disease which must be much more frequent in his part of Germany than in England; for, he assures us, that numerous examinations have convinced him, that out of every eight new-born male infants, there is always, at least, one more or less affected with the complaint. In very young infants, he thinks, that the disease is mostly overlooked or not understood, either in consequence of the swelling being mistaken for the effect of a bruise received in the birth, or of its being generally small, owing to the children being kept mostly in the recumbent posture. When the disease continues beyond the first month, and nothing is done, it will sometimes remain during the whole of childhood, the adult age, and even later. In some individuals, the swelling enlarges very slowly, being for many years of inconsiderable size; while, in others, it attains a great magnitude in a short space of time.†

Although the communication, between the abdomen and tunica vaginalis, is a condition essentially appertaining to this species of hydrocele, such state is not invariably followed by the latter disease; for experience proves, that the peritoneal canal, between the scrotum and belly, frequently remains unclosed a considerable time after birth, without any collection of fluid taking place in the tunica vaginalis. This particularity of structure, therefore, is only to be regarded as a predisposing cause, keeping up the liability to the complaint. Hence, adults who happen to have the passage open, may first become affected with this sort of hydrocele at an advanced age. Loder describes a hydrocele which had existed two years and a half in a man forty years of age, and which, as it became larger in the erect posture, and smaller in the recumbent, must have had a communication with the cavity of the abdomen.* A similar case fell under the notice of Hebenstreit.†

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* Schreger, Chirurgische Versuche, b. i. pp. 2—6. 8vo. Nurnberg, 1811.

† Ibid. pp. 7—10.

The fact of the communication between the tunica vaginalis and abdomen sometimes remaining open, without any fluid accumulating in the scrotum, led Schreger to infer, that the water was not secreted by the peritonæum, but by the inner surface of the tunica vaginalis; an opinion, however, which becomes questionable, when the effects of the plan of treatment proposed by M. Viguerie, are considered; for a cure appears to be a frequent result of simply squeezing the fluid up into the belly, and hindering its descent again by pressure. I will not say, however, that Schreger is not right in the sentiment which he has delivered upon this point, because such pressure may possibly excite the adhesive inflammation, and thus obliterate the cavity, in which the fluid was collected‡, as this author believes to be the fact.

The treatment which M. Viguerie adopted, consisted in pressing all the fluid back into the abdomen, and keeping it there with a truss, the pad of which made close pressure upon the abdominal ring. Nature then soon obliterated the communication between the abdomen and scrotum, and the patient was radically cured. This author published several cases, which were treated in this way with complete success; and Sabatier saw a boy, about six or seven years old, cured at Paris in the same manner.§ Schreger conceives, that Viguerie's mode of treatment might be rendered still more effectual, if the patient were to wear, in addition to the truss, a suspensory bandage, wet with spirit of wine, or the lotion composed of spirit of wine, vinegar, and the muriate of ammonia. ||

Viguerie's method, however, has not succeeded in the hands of every surgeon who has had occasion to try it: Desault tried it with considerable care, and, though the pressure was accurately maintained on the ring a long while, a relapse followed; and Schreger

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* Loder, Chir. Beobacht. b. i. p. 166.

† In Bell vom Wasserb. &c. p. 25.

‡ Chirurgische Versuche, b. i. pp. 18, 19.

§ Sabatier Médecine Opératoire t. i. p. 504. edit. 2. Paris, 1810.

|| Chirurgische Versuche, b. i. p. 26.

relates two other examples, in which the practice failed.* Desault, not finding the above simple treatment always have the desired effect, was induced to attempt the cure with a red-wine injection. If any of the viscera protruded from the abdomen, he used to reduce them, and then tap the hydrocele in the common manner. At the same time, an assistant made pressure on the upper part of the sac, so as to shut up the communication between the tunica vaginalis and abdomen. The injection was then introduced, and allowed to remain a short time, after which it was let out, the scrotum covered with linen dipped in the injection, and a truss applied, both with a view of hindering any remains of the fluid in the tunica vaginalis from entering the abdomen, and of preventing the descent of the viscera.† Although this practice is alleged to have been completely successful, and not to have occasioned any inflammation of the peritonæum, there can be no doubt, that, as it is a more severe mode of cure than that recommended by Viguerie, it ought to be practised only when the latter is found ineffectual. It would require also more facts, than even Desault's experience probably furnished, to justify the conclusion, that the use of an injection, when a communication exists between the tunica vaginalis and abdomen, is quite exempt from the risk of peritonitis.

HYDROCELE OF THE SPERMATIC CORD.

In some instances, this is an œdematous affection of the whole of the cellular substance of the spermatic cord; in others, the fluid is confined to one or more cavities, within the sheath of the spermatic vessels. The first case is termed simply *hydrocele of the spermatic cord;* the second, *encysted hydrocele* of this part.

The first complaint is not a very common one, does not cause much inconvenience, unless when very large, is usually mistaken for a varix of the spermatic cord, or an adherent omental hernia, and seldom leads the patient to have recourse to any means of relief, but a suspensory bandage.

When the disease is of a moderate size, the scrotum appears quite healthy, except that, when not corrugated, it seems rather fuller, and hangs rather lower on that side, than on the other. The testicle can be distinctly felt, below this fulness, quite unenlarged. The spermatic cord feels considerably enlarged, as if its vessels were varicose, or there existed an irreducible epiplocele. The tumour is broader at the bottom than at the top. It seems to diminish when compressed; but immediately resumes its former size, when this pressure is discontinued, and as easily in a supine as in an erect posture. There is a very trivial uneasiness, not in the swelling itself, but in the loins.

The only mode of radically curing the disease is making an incision into the tumour from the abdominal ring down to the testicle: but, unless the disease be very large and troublesome, the patient should be content with a suspensory bandage.

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* Chirurgische Versuche, b. i. pp. 21, 22.

† Œuvres Chirurgicale de Desault, t. ii. pp. 440—442.

ENCYSTED HYDROCELE OF THE SPERMATIC CORD.

This most frequently occupies the middle part of the cord, between the testicle and groin, and is generally of an oblong shape. It is so tense, that the fluctuation of the water within it cannot always be easily distinguished. It is perfectly circumscribed, occasions no pain, and generally presents a transparency, when a lighted candle is held behind it in a dark room. The testis and epididymis can be distinctly felt below the tumour, quite independent of it. The upper part of the cord in the groin is usually very distinguishable. As Mr. Pott observes, it undergoes no alteration from change of posture; it is not affected by coughing; nor are the functions of the alimentary canal disturbed by it.

Mr. Hey notices two forms of this disease, which are somewhat obscure. One is, when the hydrocele of the cord is situated near the abdominal ring, into which it admits of being pushed. The case, however, may be distinguished from a hernia, by the facility with which the vessels of the cord can be felt when the tumour has descended again, and the finger and thumb are pressed in between it and the ring. Neither is there any guggling sensation produced when the part goes up, nor any interruption of the functions of the bowels, when it is down. Another cause of mistake proceeds from the swelling sometimes extending below the testicle, in which circumstance, the disease may be supposed to be a hydrocele of the tunica vaginalis. The surgeon, however, will not confound these complaints, if he only be careful to recollect, that, in the hydrocele of the tunica vaginalis, the testicle, being surrounded with a fluid, cannot be felt if the tumour be much distended. But, in hydrocele of the cord, the testicle is on the outside of the cyst, and may be felt behind it.*

Infants and young persons are much more subject to this disease than adults; but it is much less commonly met with than hydrocele of the tunica vaginalis: Richerand contends, that, for one instance of encysted hydrocele of the cord, or of a collection of fluid in a hernial sac, there are on an average not less than two hundred examples, in which the fluid is contained within the tunica vaginalis.† In children, the fluid may often be dispersed by aperient medicines and fomentations. If it should not yield to this treatment, a small puncture, sufficient to evacuate the fluid, commonly produces a cure. In adults, in whom the disease is generally more obstinate, it is sometimes requisite to make an incision through the whole length of the tumour. I have seen several instances, in which a cure was effected with the red-wine injection, after the fluid had been let out by means of a very small trocar. Mr. Hey had a particular method of operating: he grasped the integuments and spermatic cord in his left hand, at the posterior part of the tumour, which he made project with the skin tightly drawn over it. He then divided the skin and fibres of the cremaster, and the subjacent cellular substance, &c. by repeated gentle strokes of the knife, till he arrived at the cyst itself, which was generally quite transparent. The projection of the cyst increased, as the parts which covered it were divided; and, when it was laid bare, nearly the whole of it protruded. The cyst was then punctured with a lancet, and all that had appeared perfectly transparent before the puncture was made, was cut off with the knife or scissars; but the posterior part of the cyst was left untouched. Mr. Hey now closed the integuments with a suture, without which they were apt to shrink back, and leave the cord projecting out of the wound. A poultice was then applied, till the inflammation following the operation had subsided.* This mode of treatment is not very dissimilar from that advised by Bertrandi; but he limited it to cases, in which the tumour was ancient and large; in other instances, he preferred a seton, or tent, as the means of cure. † Sir Astley Cooper mentions examples, in which an injection failed to produce a radical cure: he gives a preference to a seton of a single silk, introduced through the swelling with a curved needle. ‡

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* Hey's Practical Observations in Surgery, p. 558. edit. 3.

† Nosographie Chir. t. iv. p. 262. edit. 4.

CHAP. XXXVIII.

HÆMATOCELE

Signifies a swelling of the scrotum, or spermatic cord, occasioned by blood.

The disease is of four kinds, two of which have their seat in the tunica vaginalis; one within the membrane investing the spermatic vessels; and the fourth in the cellular substance of the scrotum.

1. In letting out the water of a hydrocele, a vessel, that will bleed a good deal, may happen to be wounded; an accident sometimes immediately indicated by the fluid discharged being tinged with blood. After the operation, the blood insinuates itself partly into the tunica vaginalis, and partly into the cellular substance of the scrotum, so as to form, in a very short time, a tumour nearly equal in size to the original hydrocele. In other instances, the

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* Op. cit. p. 559.

† Bertrandi, Traité des Operations de Chirurgie, pp. 188—191. 8vo. Paris, 1784.

‡ Lectures, vol. ii. p. 115.

water which flows out is but little reddened, and what has happened is not suspected till the cannula is withdrawn, when blood gushes out of the puncture. This form of hæmatocele is more likely to happen when the hydrocele is large, and has been opened with a lancet.

2. Another species is when the blood is effused in consequence of the spontaneous rupture of a vessel after the operation, and it is entirely confined to the cavity of the tunica vaginalis. In this instance, the fluid of the hydrocele, at the period of its discharge, is not tinged with blood. Hæmatocele, from this latter cause, is often observed in old men who have been long afflicted with hydroceles, which have been repeatedly opened.*

These two forms of the disease constitute what is usually understood by the term *hæmatocele*, which is distinguishable from hydrocele by its weight, its want of transparency, its obscure fluctuation, and its having been generally produced by a blow. †

3. The third arises from a rupture of a branch of the spermatic vein.

4. The fourth case is of the same nature as ordinary effusions of blood in the cellular substance of other parts of the body. Like them, it is frequently caused by blows, and it yields to similar treatment. I have sometimes known it take place to a considerable extent after lithotomy done with the gorget; and Richerand relates an example, in which a very large effusion of blood in the loose cellular membrane of the scrotum and perinæum followed castration. ‡

The two first cases may generally be cured by opening the cavity of the tunica vaginalis, removing the effused blood, and applying a poultice. If the quantity of blood were very small, perhaps, discutient applications and purgatives ought first to be tried.

The species of hæmatocele, arising from a rupture of the spermatic vein, is generally caused by great exertions, contusions, &c.

When the case is clearly distinguished from a hernia, attempts must be made to promote the absorption of the extravasated blood, by applying the lotion, composed of spirit of wine, vinegar, and muriate of ammonia. The patient, if young, or not too much reduced, should also be bled, and freely purged. A bag-truss is to be worn, and the patient kept in bed. When, under this treatment, the swelling, instead of diminishing, increases in size, the bag-truss may be tightened, and compresses laid upon the scrotum, wet with the coldest water that can be procured. §

If the case should obstinately resist all these means, a thing which seldom happens, an incision must be made into the tumour, and the bleeding point being discovered, it should either be tied, or stopped with a dossil of lint. According to Richter *, when the hemorrhage is found to proceed from one of the trunks of the spermatic veins, castration is indispensably necessary; but, as the bleeding from the largest veins may generally be stopped by pressure, I should be reluctant to let a patient lose a testicle, merely on account of the accidental rupture of one of its veins.

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* Jamieson, in Medical Essays of Edinburgh, vol. ii. art. 14.

† Sir A. Cooper's Lectures, vol. ii. p. 114.

‡ Nosographie Chir. t. iv. p. 260. edit. 4.

§ Richter, Anfangsgr. der Wundarzn. b. vi. p. 134.

In the case of blood effused in the cellular membrane of the scrotum, a free incision is the best practice, when the swelling is excessive, or resists discutient means; but, in other instances, it will be sufficient to keep up the scrotum with a suspensory bandage, apply the lotio ammoniæ muriatæ, and exhibit two or three purgative draughts.

Should inflammation of the parts arise, venesection, leeches, and febrifuge medicines would be proper, with cold evaporating lotions; or, if suppuration were unavoidable, an emollient poultice.

CHAP. XXXIX.

DISEASES OF THE TESTICLE, SARCOCELE, &c.

Sarcocele is a term applied to every chronic, fleshy enlargement of the testicle. Hence, not only several kinds of sarcoma affecting this body, and noticed in the chapter on that subject, acquire this name, but also some diseases of the testicle generally considered to be scrofulous: even fungus hæmatodes, scirrhus and cancer, when situated in this part, have been improperly blended with numerous other morbid affections, and comprehended under one common title, *sarcocele*. When the disease is attended with an accumulation of water in the cavity of the tunica vaginalis, it is not unfrequently named *hydro-sarcocele.*

The induration and swelling of the testicle, remaining after a simple inflammation of that organ, are not usually called sarcocele, as they rarely increase, or give any pain or trouble. The swelling of the testis also, arising in patients affected with syphilis, independently of gonorrhœa, or any disease of the urethra, is seldom of a dangerous or malignant nature; and the same remark may be made upon most indurations confined to the epididymis, which are generally much less disposed to end in a disease subversive of the natural structure of the testicle, than chronic swellings of the body of this gland. Still there are particular indurations, commencing in the epididymis itself, which are liable to change into a disease that will ultimately destroy the patient, unless the part be removed.*

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* Richter, Anfangsgr. der Wundarzn. b. vi. p. 135.

OF COMMON SARCOCELE.

This disease is of the same nature as the ordinary vascular sarcoma described by Mr. Abernethy, and treated of in the first part of this book. The testis becomes larger than natural; and this increased size, which, in some cases, is inconsiderable, in others, attains a degree, in which the part affected is as large as two fists. While the tumour is of moderate dimensions, the shape of the testis is partly retained; the swelling being oval and flattened at the sides, with its larger end turned upward and forward, and its smaller directed downward and backward. Its weight is very considerable, in comparison to its size; and it is its nature to remain a long while indolent, giving but little pain, except it be left unsupported, when from the dragging of the spermatic cord more or less annoyance is produced. The scrotum is of its natural colour, without any augmentation of its temperature, or any signs of fluctuation. At first, the spermatic cord is unaffected, and of course the swelling does not extend quite up to the abdominal ring; but, after a time, the disease generally extends higher up, and the cord itself becomes enlarged. However quiet and indolent a common sarcocele may be in its incipient stages, and even for years, the possibility of its assuming a more painful and malignant nature should never be forgotten, because it is a fact, that ought always to be allowed to weigh in considering the propriety of persevering in attempts to save the part.

SCROFULOUS DISEASE OF THE TESTICLE.

The testicle is sometimes converted into a truly scrofulous mass, being enlarged, and when cut into, presenting a whitish or yellowish coagulated matter, mixed with pus.

The complaint is not attended with so much pain and induration as a scirrhous disorder of the testicle; nor does it produce any unfavourable state of the health.

FUNGUS HÆMATODES OF THE TESTICLE.

This incurable disease, called likewise *medullary sarcoma*, or *soft cancer* of the testicle, is by no means unfrequent, and particularly demands the earnest attention of the surgeon, not only on account of its fatal character, but also because it is a distemper very insidious in its attack, and peculiarly liable to be mistaken for a common hydrocele. It is described by Dr. Baillie under the name of the

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* See Pott's Chirurgical Works, vol. ii. pp. 458—461. 8vo. Lond. 1808.

pulpy testicle. The testicle (says he) is sometimes much enlarged, and converted into an uniform pulpy matter, in which its natural structure is entirely lost. This sort of change has been sometimes mistaken for scirrhus, but it is very different from what is called scirrhus in other parts of the body, and what is also found in the testicle itself. *

According to the excellent description given of it by Mr. Wardrop, fungus hæmatodes of the testicle is mostly seen in youngish persons under the age of thirty. In some cases, it begins in the body of the organ, while, in others, its origin is attended with a tumour in the epididymis. The progress of the disease is very slow, and, as the swelling of the gland increases, the tumour retains an oval, or globular form, and it becomes difficult, if not impossible, to distinguish the body of the testicle and epididymis from one another. The pain of the disease is generally so trifling as to excite little alarm, and there is no inequality, no hardness in the gland, nor any change in the structure of the scrotum. When the testicle has increased considerably in bulk, it becomes remarkable for its softness and elasticity, and produces a sensation, as if it contained fluid. † Hence, the disease has often been mistaken for hydrocele, and punctured: nay, so deceitful is the feel of the tumour, that cases have occurred, in which the surgeon was so persuaded of the presence of fluid, that he was not content with thrusting a lancet into the swelling once, but after a few days, actually repeated the same pernicious experiment. ‡

I know of no writer, who has pointed out the distinguishing marks of these two very different diseases so well and correctly as Mr. Wardrop. The want of transparency in the tumour (says he) is one appearance in fungus hæmatodes of the testicle, which might be expected to lead to an accurate diagnosis between it and hydrocele; but, as there are many collections of water in the vaginal coat of a dark colour, and sometimes even of blood, and as the vaginal coat is often very much thickened, this cannot be always regarded as a diagnostic symptom. Fungus hæmatodes of the testicle, when of considerable bulk, though resembling many of the more frequent varieties of hydrocele in shape, yet, on inquiry, will not be found to have had a similar progress. In hydrocele, the water begins to collect at the bottom of the scrotum, and the testicle may generally be distinguished at the posterior part, until the tumour has acquired a very large size; whereas, in fungus hæmatodes, the disease commences in the body of the testicle, or in the epididymis, and the whole gland gradually enlarges. The tumour, too, in hydrocele, is accurately circumscribed towards the ring, whereas in fungus hæmatodes, there is a gradual swelling, or fulness, extending up from the testicle along the spermatic cord. This fulness is described as being very different also from the unyielding hardness of a scirrhous affection of the part. In judging of the nature of the disease, the comparative weight of the swelling, to that of a hydrocele of equal bulk, is likewise to be considered.

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* Baillie's Morbid Anatomy of some of the most important Parts of the Human Body, p. 350. 8vo. Lond. 1807.

† Wardrop, Observations on Fungus Hæmatodes, or Soft Cancer, pp. 124—126. 8vo. Edinb. 1809.

‡ See Practical Observations in Surgery and Morbid Anatomy, by John Howship, p. 325. 8vo. Lond. 1816.

Fungus hæmatodes of the testicle, when large, sometimes becomes hard at some points, and soft at others, where the swelling seems as if it were about to break. As far as Mr. Wardrop's experience goes, it is not common for the scrotum to give way, and a fungus to protrude; but, if the patient live long enough, the disease may follow such a course.* When this happens, some points of the scrotum become discoloured, and more prominent than others, inflame, ulcerate, and discharge a small quantity of matter, and out of the new-formed openings the fungous mass shoots with more or less rapidity. Hemorrhages now take place from the excrescence from the slightest causes. The disease, which in its commencement was not very painful, is attended in a more advanced stage with severe pain shooting up the spermatic cord to the loins. Hectical symptoms gradually come on; the absorbents, glands in one or both groins, along the spermatic cord, at the side of the aorta and vena cava, and in various situations within the abdomen, become converted into a pulpy substance, similar to that of the testicle; and the patient at length falls a victim to a disease, which appears in most instances to be rather of a constitutional, than a local nature. In many cases, experience proves, that vestiges of the disease may be traced in a variety of other parts of the body at the same time, the kidneys, liver, brain, &c. When the fungus projects through the skin, the patient's fate is sometimes accelerated by repeated bleedings. † On examination of the testicle, after its removal from the body, its natural texture appears entirely lost, and it is found converted into a soft pulpy matter, not unlike the medullary substance of the brain.

SCIRRHOUS TESTICLE.

The testicle is often converted into a hard mass, of a brownish colour, generally intersected by membranes, and sometimes containing cells, filled with a sanious fluid.‡ This is the truly scirrhous testicle, which is attended with great hardness, severe pains darting along the spermatic cord to the loins, and an unequal knotty feel. The health is generally much impaired.

Sooner or later, the scirrhous induration extends from the epididymis upward along the spermatic cord, even within the abdominal ring. In the latter circumstance, the lymphatic glands in the loins usually become diseased; and this extension of mischief, together with the impossibility of removing the whole of the diseased cord, too frequently deprives the patient of every chance of recovery.

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* See Practical Obs. in Surgery and Morbid Anatomy, by John Howship, p. 129. 8vo. Lond. 1816.

† Ibid. p. 331.

‡ See Baillie's Morbid Anatomy, pp. 352, 353. edit. 2.

It is now well known, that various sarcomatous enlargements of the testicle, at first quite indolent, and exempt from pain, and every alarming complication, such as swelling and induration of the cord, tumours of the inguinal glands, and swellings within the abdominal parietes, are capable of assuming, in a very sudden manner, a malignant and cancerous tendency; and that sometimes the scirrhous induration of the cord makes rapid progress upward. When these changes have taken place, attended with severe hectical symptoms, extreme emaciation, a pallid wan face, and a tendency to anasarca, no measures which the healing art can suggest, will now save either the diseased part, or the patient's life. Hence, that surgeon acts with prudence, who recommends an early extirpation of every testis that is incurably diseased, and entirely deprived of its original organization.

As leaving a man with a malignantly diseased testicle, quite unassisted, to meet his lingering fate, is a very serious step, all surgeons ought to be well apprised, that every enlargement of the spermatic cord is not of that particular description, which amounts to a prohibition of the operation.

One enlargement of the cord is perfectly free from malignancy, and proceeds either from a varicose dilatation of the spermatic veins and arteries, or from a collection of fluid in the membrane enveloping the said vessels. In this case, the cord, though enlarged, is smooth, soft, and compressible; the whole process is loose and free, will easily permit the fingers of an examiner to go all round it, and to distinguish the parts of which it is composed; and it is not painful when touched.

In that morbid state of the cord, in which the operation is forbidden, the part is unequally hard and knotty; the parts, of which it consists, are undistinguishably blended together; and handling it occasions pains, shooting up to the loins and back. In cases of decided fungus hæmatodes, any enlargement of the cord is fatal to the success of the operation.

I should be sorry, if the foregoing observations were to deprive a single individual of the chance of avoiding a severe operation, and preserving an organ, to which in general the highest value is attached. That there are some chronic enlargements of the testicle, which may be resolved, is a truth, of which experience must have convinced the generality of surgeons. The scrofulous induration, and several other swellings of this organ, which are very imperfectly understood, I believe, may sometimes be benefited, and even entirely cured, just like some analogous affections of the breast. Hence, though I am advocate for the early performance of castration in cases of sarcocele, where there is reason to suppose the disease so far advanced, that the organization of the testicle is totally destroyed, or where internal and external remedies have been tried a certain time in vain, this sentiment does not incline me to recommend the operation for other examples, in which the disease is quite recent, and no plan of treatment has been fairly tried. What makes this remark still more worthy of attention, is the important fact, that every chronic enlargement of the testicle, though it be of long standing, does not necessarily imply an incurable change of structure in the part; for, if this were the case, the disease considered by Pott, and others, as the venereal sarcocele, would not admit of relief, which daily experience fully contradicts. This affection of the testicle is described as being independent of a gonorrhœa, or of any disease in the urethra; seldom an early symptom; and either immediately preceded, or accompanied by some other appearance plainly venereal. It has neither the inequality, nor darting pains of scirrhus, and always gives way to a mercurial process properly conducted. * The disease of the testicle, usually considered as scrofulous, may sometimes be diminished by administering internally cicuta and calomel, and applying to the scrotum, lotions, or poultices, made with sea-water; but the most powerful medicine is unquestionably iodine, which should be used both internally and externally. Several other cases yield to a course of mercury; leeches being daily applied to the scrotum, or frictions made on the part with camphorated mercurial ointment. In every case, the diseased organ must be well supported by means of a suspensory bandage. According to Mr. Ramsden, that species of sarcocele which he called sclerocele, admits of relief, by removing with bougies the morbid irritability of the urethra, with which he considered its origin to be frequently connected. †

The same kind of case is noticed by Sir Astley Cooper, under the name of the *simple chronic enlargement* of the testis, which, he observes, may be cured by confining the patient in bed a month; giving two, or three grains of calomel, and a grain of opium, night and morning, until the mouth is sore, which is to be kept moderately so for a month; applying leeches, or opening the veins of the scrotum with a lancet, twice a week; applying to the scrotum equal parts of the camphor mixture and vinegar; and giving every fourth morning an active dose of the infusion of senna with salts. Then, if the urethra be diseased, the silver sound is to be employed. ‡ When the disease has advanced to suppuration, however, the testis will sometimes require to be removed.

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* Pott's Chirurgical Works, vol. ii. p. 393. 8vo. Lond. 1808.

† See Pract. Obs. on the Sclerocele, &c.

‡ Sir A. Cooper, Lectures, vol. ii. pp. 146—148.

FUNGUS OF THE TESTICLE.

There is a particular affection of the testicle, in which a fungus grows from the glandular substance of this body, and, in some cases, from the surface of the tunica albuginea. This excrescence is usually preceded by an enlargement of the testicle, in consequence of gonorrhœa, a bruise, or some species of external violence. A small abscess takes place and bursts, and, from the ulcerated opening, the fungus gradually protrudes. In some instances, the disease is accompanied with great irritability of the urethra, or strictures.*

If, when the inflammatory affection of the testicle has subsided, the substance of this body should not be much indurated or enlarged, it is a very rational practice to endeavour to extirpate the fungus, and diseased portion of the testis, without removing the whole of this body.

The object may sometimes be fulfilled by destroying the fungus with the lapis infernalis. But, at all events, the fungus, and whatever superficial portion of the substance of the testicle is diseased, might be removed with a knife. Such an operation I once saw performed in St. Bartholomew's Hospital, by the late Sir James Earle, and the part healed up in the most favourable manner. I have also seen the fungus successfully extirpated with a ligature; a method, which answered in the practice of Mr. Wadd: in one instance, however, as the fungus began to rise up again, its destruction was completed with caustic.†

Though this seems to be a judicious practice, when the organization of a considerable part of the testicle is not totally subverted by disease, and, particularly, when the fungus grows entirely from the tunica albuginea; yet, if the whole substance of the testicle were so diseased, that the part would still be an useless and troublesome mass, though the fungus were removed, the surgeon ought undoubtedly to perform castration. A surgeon is not, however, hastily to advise this operation in every instance of fungus of the testicle, attended with swelling and induration of the part. Both the cases recorded by Mr. Wadd were complicated with induration and enlargement of the testicle: yet, after the fungi had been removed, and the irritability and strictures in the urethra cured with bougies, the sarcocele underwent in one case material amendment, and, in the other, the enlargement, after being considerably reduced during the use of bougies, was entirely removed with the aid of mercurial friction.

An interesting paper on this disease, illustrated by cases, was published by Mr. Lawrence; and as it conveys an accurate idea of the real nature of the case, I would recommend it to the attention of every practitioner.* In the best modern works, published abroad, every disease of the testicle, exhibiting the appearance of a fungus, is indiscriminately condemned to castration; and English surgeons have often advised the same practice, in consequence of not understanding the true character of the complaint. This disease, however, must not be confounded with other fungi, which sometimes arise from the testicle, in cases of cancer and medullary sarcoma of this organ, and which, if the cord be but little affected, the glands and viscera not obviously diseased, and the health not too far gone, require castration, as the only possible, and yet uncertain, means of relief.

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* Wadd's Cases of Diseased Bladder and Testicle, pp. 45 and 47.

† Op. et loc. cit.

HYDROCELE, WITH DISEASED TUNICA VAGINALIS, LIABLE TO BE MISTAKEN FOR SARCOCELE.

The tunica vaginalis sometimes becomes very much thickened, indurated, and even cartilaginous, at the same time that its cavity is filled with fluid. Schmucker met with hydroceles, which felt as hard as a sarcocele; and Saviard states, that they are sometimes attended with the hardness of horn. The feel of the tumour may deceive the surgeon, and make him suppose the case a hydro-sarcocele, while, in fact, the testis itself is perfectly sound. Forestus mentions a patient, who had an indurated swelling of the testis, distending the scrotum, like a scirrhus: for five years it continued to get larger; and every surgeon, who saw it, regarded it as a sarcocele. At length, under the use of emollient applications, it became softer, and burst, when a large quantity of water was discharged, and the swelling of the scrotum subsided. Here was an instance of hydrocele, probably attended with a thickened tunica vaginalis; a disease which might have been cured much sooner, had it not been for the mistake in the diagnosis. I have seen several preparations of this disease in anatomical museums, and, in general, castration had been injudiciously performed. What makes a mistake of this kind still more likely to happen, is the circumstance of a hydrocele sometimes deviating from its usual character by being attended with pain. An experienced surgeon assures us, that he has seen instances, where, from the enlargement and the painful sensations of the part, it had been thought advisable to extirpate the testis, on presumption of that being the part aggrieved; but, upon making an incision through the scrotum and tunica vaginalis, a quantity of lymph suddenly gushed out; the testis presented itself of its natural size and appearance: thus, the nature of the disease was accidentally manifested, and a cure fortunately effected, without the operation of castration. Hence, where the disease is complicated, and doubtful, a puncture should always be made in the tumour, just before proceeding to remove the testis; an experiment that will give but very little pain, and sometimes save the patient from castration; while the latter operation, if found the only means of cure, need not be delayed on account of the previous step, that has been taken as a measure of precaution.*

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* See Edinburgh Medical and Surgical Journal, vol. iv. p. 257.

A hydrocele, with a considerably thickened tunica vaginalis, is a case, for which, as I have related in the chapter on hydrocele, the radical cure by incision is yet regarded by some authors as the most eligible; because the surgeon is thereby enabled to cut away the hardened membrane, and to ascertain, with his own eyes, the actual state of the testicle. I have explained, however, that the necessity of cutting away the thickened tunica vaginalis is not generally admitted by surgeons in England. Mr. C. Bell positively rejects the doctrine; and the late Sir James Earle adduced cases, which appear to be fair proofs, that hydroceles may be generally cured by an injection, though the tunica vaginalis be a good deal thickened. Nay, Desault goes further, for he questions the accuracy of the common advice, never to attempt a radical cure with the injection, when the testis is enlarged: on the contrary, he urges as a maxim in practice, that those incipient swellings of the testis, in which this organ has not yet acquired the weight that is characteristic of a scirrhus, far from being an impediment to the operation for the hydrocele by injection, are cases which particularly require such treatment, as the means of curing at once both the disease of the tunica vaginalis, and of the testicle. His remarks are corroborated by several interesting cases, in which the practice was tried with success. Desault, at the same time, cautions surgeons against making a trial of this plan, when the testis is scirrhous, and in the instances in which he himself adopted the plan, though the testis was considerably enlarged, it was not indurated; a circumstance demanding especial attention.†

SARCOMATOUS THICKENING OF THE SCROTUM.

Another disease, liable to be confounded with sarcocele, is a great and sometimes an enormous thickening of the scrotum itself. This case is more frequently met with in warm, than cold, or temperate countries; but it has been seen both in this country and in France.‡ Though the scrotum may attain a magnitude which is truly surprising, the testes, concealed in the mass of new-formed matter, remain perfectly sound; and the principal grievances depend upon the manner, in which the patient's fitness for every active employ, and even his capability of walking, riding, and taking exercise, are destroyed by an enormous swelling, which sometimes weighs nearly a hundred weight. The only mode of relief consists in cutting the diseased scrotum away, in doing which, the operator is to avoid injuring the spermatic cord and testicles.

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* See Warner's Cases in Surgery, p. 291. edit. 4.

† See Œuvres Chir. de Desault, t. ii. pp. 445—448.

‡ See the Case of M. Delacroix in Richerand's Nosographie Chir. t. iv. p. 315. edit. 4.

CHAP. XL.

CASTRATION.

In some cases of sarcocele, the performance of the operation is optional; in some, absolutely and immediately necessary; in others, altogether unfit to be attempted, as presenting no chance, either of temporary, or permanent advantage.

When the plans of treatment which I have spoken of, as meriting trial in cases of sarcocele, are found to be ineffectual, the surgeon should generally have recourse to the operation, because the patient will thereby be freed, not only from the pain and inconveniences arising from the magnitude and weight of the tumour, but also from the danger of its suddenly changing into a malignant form of disease. It is true, the records of surgery furnish us with many instances, in which a sarcocele continued quiet and stationary the whole of the patient's life, whence it might be inferred, that, if the preceding advice were followed, the operation would often be done unnecessarily, and a testis removed which would never occasion serious trouble. But, in opposition to this consideration, it should be remembered, that as an irrecoverably diseased testis is a perfectly useless mass, its removal subjects the patient to no important loss, while it delivers him from all the inconvenience occasioned by the size and weight of the swelling; and that, as it is never possible to know before-hand, how long the disease will remain quiet and stationary, the operation is advisable on the ground of its freeing the patient from every apprehension and risk of an unfavourable change.

It must be acknowledged, that there are some cases, in which the operation may be safely postponed; as, for instance, when the disease is the consequence of a recent inflammation of the testis, or, when it is of that kind which Pott and some other writers denominate (with what accuracy I will not pretend to say) the *venereal sarcocele*. The *scrofulous* sarcocele is also another form of the complaint, little apt to degenerate into a disease, which has itself much effect upon the health, or any great tendency either to become actively painful, or to extend suddenly up the cord, and render castration unavailing. This sarcocele is itself only a symptom, or effect, of a specific constitutional disease, for the relief of which, the removal of the testis can never do any material good, except inasmuch as the part may sometimes contribute in a secondary manner to the impairment of the health, by causing mental anxiety, trouble, pain, and confinement. Unfortunately, however, when there are no other manifest traces of scrofula present, the diagnosis of this kind of sarcocele is not always sufficiently plain in practice; and, frequently, amidst the uncertainty of its truly indolent character, a perpetual alarm is felt, lest it should undergo any sudden unfavourable change. With respect to sarcoceles in general, I may join Richter* in asserting, that, when the swelling is small, the hardness not very great, and the disorder has proceeded from an external cause, the operation should not be hastened; and, in every case, where it is advisable to defer the removal of the part, the inconvenience, produced by its size and weight, may be considerably lessened by the use of a bag-truss.

The operation should never be practised when the constitution, or any of the viscera, participate in a similar affection to that situated in the part about to be removed. Thus, in fungus hæmatodes of the testis, where the disease is rarely, perhaps never, limited to this organ, castration is often forbidden, on account of the obvious inutility of removing one part of the distemper, while more than enough to destroy the patient must still be left behind, in situations quite inaccessible to the hand or knife of the surgeon. The general account of this destructive disease, contained in the first part of the present work, renders it unnecessary here to enter into any recapitulation, concerning the manner, in which it commonly invades numerous parts together, the testes, absorbent glands in the course of the great vessels, the kidneys, liver, lungs, and even the brain and its membranes. How useless any attempt to relieve the patient by castration must be, when the symptoms render it certain, that the disease has extended to the glands and viscera, is indeed a fact, too evident to require any comment. But, notwithstanding the correctness of these generally received doctrines, I would not presume absolutely to forbid the operation, though the case were fungus hæmatodes, provided the general appearance of the patient were healthy, without any manifest signs of disease in the glands, spermatic cord, or viscera. At the same time, I have never known a lasting recovery follow the removal of a testis affected with fungus hæmatodes, though the patient at the time of the operation appeared to be in other respects healthy. The complaint frequently returns in the loins and spermatic cord.† An example, in which a testis thus diseased was removed from a gentleman, in whom no other vestiges of this or any other complaint could be traced before the operation, was communicated to me by my friend Mr. Lawrence, who was himself the operator, and whose examination of the part after its removal, left him convinced, that the disease was a true fungus hæmatodes. Here the wound healed up very well; but the patient was soon afterwards carried off by the effects of disease in his chest.

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* Anfangsgr. b. vi. p. 146.

† Sir A. Cooper, Lectures, vol. ii. p. 156.

With respect to what is termed the scrofulous sarcocele, it would also be condemned as unfit for the operation by the maxims already premised, because here the whole constitution must be supposed to be unsound. Yet, I believe, this case must often be an exception to the rule delivered, of not resorting to castration, unless the disease be local, and capable of entire removal. A scrofulous sarcocele, though no doubt complicated with a constitution prone to evince other effects of that disease, is sometimes unaccompanied with any other discoverable defect, or alteration of structure in other parts of the body. In this circumstance, if the disease of the testis be a source of grievance, castration should be performed; for experience fully proves, that the wound heals up very favourably after the removal of a scrofulous part, and there is no certainty, that any scrofulous disease will afterwards show itself in other organs. If it should not, the patient will be permanently cured; and if it should, the operation itself will have no share in contributing to the fresh attack, which may also be both more tolerable and curable than the sarcocele. In short, a scrofulous testis, when attended with great annoyance and inconvenience, (which it sometimes is not, on account of its indolence,) is circumstanced, with respect to castration, exactly as a scrofulous disease of a joint is with regard to amputation.

In considering the propriety of castration in cases of sarcocele, nothing can be wiser than the general maxim, not to employ the knife, if there be any traces of disease in the viscera; and therefore it may be inferred, that the operation will not answer when the patient has very frequent attacks of colic pains, a pallid leaden-coloured countenance, indigestion, loss of appetite, frequent purging, a hard belly, or any distinct and separate indurations about the abdomen. In cases of fungus hæmatodes, or soft cancer of the testis, the kidneys often partake of the disease; and hence, the prudence of always making careful enquiry into the state of those organs, before venturing to propose the operation. It is to be recollected, however, that the weight of the enlarged testis frequently produces in the loins extremely painful sensations, which might be mistaken for symptoms of diseased kidneys, if the difference were not indicated by the pain always diminishing, when the scrotum is well supported in a bag-truss, or the patient keeps himself in the recumbent posture. In such cases, the state of the urinary secretion would also afford useful light.

Sometimes there are swelled glands in the groin, or near the abdominal ring, which are highly unfavourable whenever the disease of the testis consists of any species of sarcoma, characterized by malignancy and a disposition to extend to other organs.

In cases of sarcocele, attention should also be paid to the state of the thoracic viscera; for experience proves, that various complaints of the chest frequently precede or follow the origin of a sarcocele, and seem to have a connection with it. In fact, in cases of soft cancer of the testis, the structure of the lungs is often found interspersed with pulpy, medullary tumours, the fatal nature of which is proved by the dissection of the very patient, in whom this morbid appearance is seen. Hence, when the patient has a constant dry cough, shortness of breath, and irregular pain in the chest, and especially when these symptoms attend a fungus hæmatodes testis, the operation is unadvisable.* The success of castration very much depends upon the state of the spermatic cord; for here it is a point of the first-rate importance to remove every particle of the disease—every thing which appears unsound and indurated. This can easily be accomplished when the disease is confined to the testis and epididymis, the cord being unaffected. But when, as often happens, the latter part is in the same state as the testis, hardened and enlarged, the operation is improper. If the disease of the cord, however, were not to extend quite up to the ring, and its upper portion were still sound, it would yet be practicable to remove all the parts affected by cutting the cord through where it is quite healthy, and the operation be justifiable. But, it is not to be denied, that, in such a case, the event is subject to great uncertainty, not so much on account of the commonly feared danger of cutting the cord through near the ring, as because the extension of the disease up the cord is always a ground for apprehending, that the complaint may not now be altogether local.

However, unless the case be fungus hæmatodes, it is only when the cord is truly scirrhous, that is to say, thickened, hardened, knotty, and painful, that it becomes an impediment to the operation; and, when its enlargement is owing merely to a varicose dilatation of the vessels, or an effusion of fluid in the cellular membrane of the part, the circumstance should not prohibit the use of the knife. Both these last states of the spermatic cord are noticed in the preceding chapter, and may always be distinguished from the scirrhous alteration of the part by their greater softness, and their diminishing when the patient keeps himself in a horizontal position.

According to a modern writer, the circumstance of the scrotum being diseased in the case of a scirrhous testicle, is nearly as unfavourable to the success of the operation, as disease of the cord †, the distemper sometimes recurring in the skin. However, there is this difference, that we always have it in our power to cut away every part of the scrotum which may be affected, while, in the case of scirrhous affection of the cord, it is sometimes impossible to follow the disorder to its highest point.

Castration is one of the most simple, and yet one of the most painful operations in surgery, especially when practised according to the old method, in which it was the custom to include in the ligature all the vessels and nerves of the spermatic cord. At the moment of doing this, the patient was put to excruciating torture; such suffering, indeed, as few could endure without complaint, however great their fortitude.*

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* Richter, Anfangsgr. b. vi. p. 147.

† C. Bell, Operative Surgery, vol. i. p. 223.

In the removal of a diseased testicle, the first thing is the incision through the integuments: it should commence a little above the place where the operator purposes to divide the spermatic cord, and be continued down nearly to the bottom of the scrotum. There is an advantage, indeed, in letting the cut extend quite down to this point, because this free division of the skin will afterwards tend in a very essential manner to prevent those lodgments of matter, which often seriously retard the cure. The first incision through the integuments will of course divide some of the branches of the external pudendal artery, which arise from the crural, and if they bleed profusely, the best plan is to secure them at once with small silk ligatures, the ends of which may be cut short, in the manner practised by M. Roux.† The second object is to expose and detach the spermatic cord from the surrounding fat and cellular membrane, which may be easily done by making a short incision on each side of it at the point where it is intended to divide it, and then, having raised it a little up, continuing the dissection of it from the subjacent parts. When its detachment is sufficiently completed to allow it to be conveniently taken hold of, and lifted up, between the thumb and forefinger of the operator's left hand, this second step of the operation is accomplished. It is a business which should never be done in a hasty and slovenly way; for it is possible for a portion of omentum and a hernial sac to put on somewhat the appearance of thickened cellular membrane, in which circumstance, a careless surgeon would be apt to cut the protruded parts in the dissection, or even divide the sac at the time of dividing the cord; an accident which has really happened.‡ The third object is the division of the cord; a most important part of the operation. The chief caution to be observed here is to make the incision through the part higher than the extension of the disease; for, if this be neglected, the patient will derive no effectual relief from the operation, and the wound will either not heal up at all, or if it heal at first, will soon break out again. The way of proceeding also in this part of the business, is different with different surgeons. Some operators, previously to cutting the cord through, pass a ligature under it with an aneurism-needle, tie it with great firmness, and, through an immoderate apprehension of bleeding, spare neither the nerves, the vas deferens, nor the cremaster. The cord is then divided below the knot of the ligature with a curved bistoury. This is the old method of operating; a method productive of the greatest agony to the patient, and now happily rejected by every humane and skilful surgeon. Others make a slight deviation from the foregoing mode of tying the whole cord, and, aware of the inutility and pain of including the vas deferens in the ligature, and of the facility, with which this vessel can be distinguished at the back of the cord by reason of its firm feel, they pass the ligature between it and the rest of the cord, over the front of which the knot is made. In the greater number of instances, in which I saw castration done at St. Bartholomew's hospital in the course of my apprenticeship there, the last method was selected; and though it is a degree better than the abominable practice of surrounding the whole cord with a ligature, it cannot be said to be deserving of imitation; for the agony, created by the inclusion of all the spermatic nerves, is not only severe, but absolutely unnecessary in a proceeding, the sole aim of which should be the security of the patient from hemorrhage. A far better plan is to apply no ligature in any way to the spermatic cord previously to its division; but to hold the part between the left thumb and fore-finger, just above the point where it is to be cut through, which is to be done as near to the diseased testicle as the healthy state of the cord indicates. The surgeon may then either imitate Mr. Bromfield, and deliver that extremity of the spermatic cord, which is separated from the testicle, to an assistant, who is to press it between his finger and thumb to prevent any hemorrhage, until the diseased testicle is removed from the scrotum, and an opportunity is given to take up the spermatic arteries with the forceps or tenaculum, as separately as possible from the nerves *; or the still better plan, adopted by Desault, may be pursued, which consisted in dividing the cord in the preceding manner, and then holding the upper end of it between the thumb and fore-finger of his left-hand, while, with the forceps or tenaculum in his right-hand, he immediately proceeded to take up the mouths of the spermatic arteries, and afterwards continued the dissection of the diseased testis from the scrotum. † Besides the spermatic arteries, the artery of the vas deferens must be sought for, and if it bleed much, have a fine ligature put round it. Desault's method I conceive to be the best, because if the upper portion of the cord should happen to be short, the attempt to transfer it to the hand of the assistant would be attended with some risk of its slipping away, and retracting within the abdominal ring, before the

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* Le Dran appears to have entertained a just aversion to this painful and unnecessary plan: "Of the several parts of the cord, (says he,) none but the artery will bleed; why then should the cremaster muscle, the vas deferens, and the nerve be tied with it? We are sensible, that convulsive motions have ensued from this method of making the ligature upon them all." Operations in Surgery, p. 147. transl. by Gataker, edit. 2.

† See Sketches of the Medical Schools of Paris, by John Cross, p. 141. 8vo. Lond. 1815.

‡ "After the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by the protrusion of several convolutions of small intestines."

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* W. Bromfield, Chirurgical Observations and Cases, vol. ii. p. 336. 8vo. Lond. 1773.

† Œuvres Chir. de Desault, par Bichat, tom. ii. p. 451.

arteries were secured. But, when the surgeon holds it steadily between the thumb and fore-finger of his left-hand, until he has taking up the mouths of the bleeding vessels, no chance of its premature retraction is incurred. The fear of such an accident has had a great deal of influence over the conduct of many surgeons in this part of the operation, and their alarm has been increased by Mr. B. Bell's having seen the thing happen twice in his practice, when both the patients were lost by hemorrhage. But, had the operator, in these unfortunate examples, been careful to take firm hold of the upper portion of the cord, before he ventured to divide it, the retraction could not have happened; and, when it did happen in consequence of this neglect, had he had discernment enough to know what ought then to have been done, neither of his patients would have fallen a victim to bleeding. In short, had he considered the course which the cord takes obliquely upward and outward, it would have been easy for him to have followed the bleeding part with perfect safety, even to the origin of the cremaster muscle, which pulls it up. * It must be obvious, that the retraction of the upper portion of the cord within the ring must be more likely to happen, when the extension of the disease upwards obliges the surgeon to divide the part higher up, than will well allow the retraction to be securely prevented by the thumb and fore-finger of the left hand. In cases of this description, it has been proposed to avert the accident, by separating the cord into two fasciculi, and with the aid of a needle, putting a double ligature betwixt them, before the part is cut through. The design of this ligature is to draw down the cord, while the surgeon is taking up the mouths of the vessels; or, if he cannot thus stop the hemorrhage, one portion of the double ligature is recommended to be tied over the front, and the other, over the posterior part, of the cord. † Another plan consists in raising the exposed cord by passing under it the left forefinger, and then, instead of cutting the part through at once, leaving the posterior third of it undivided. The first incision will divide the principal artery and its branches, which are to be taken up singly, while the weight of the testis hinders the part from retracting. Then the vas deferens is to be cut, and, if its artery be not large enough to require a ligature, the rest of the cord is to be divided. ‡

Desault's mode of operating, when the disease of the spermatic cord reaches high up, appears to me, in every respect, worthy of imitation. He was perfectly aware, that, in cases of sarcocele, the weight of the testicle draws the cord further out of the abdominal ring than is natural, and that when that process is enlarged and indurated a good way upward, the sound portion of it, situated at or near the ring, was originally placed far within that aperture. Hence,

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* See Operative Surgery, by C. Bell, vol. i. p. 229.

† C. Bell, vol. cit. p. 228.

‡ Ibid. p. 225.

as soon as the weight of the testis is taken oft, a considerable retraction of the cord instantly follows, and the end of the healthy portion of it slips immediately into the ring. When the spermatic cord was diseased high up, Desault varied his mode of operating, and, instead of dividing the cord, before he had separated the testis from its loose connection with the scrotum, he first completed the dissection of the diseased mass, and secured whatever vessels required ligatures in the cavity of the scrotum. He then gently drew the spermatic cord a little further out of the ring, until he had enough to take secure hold of with his left thumb and fore-finger, above the high point where the disease made it absolutely necessary to cut it through. Lastly, the operation was finished by dividing the cord, and taking up its arteries with the tenaculum, or forceps; the surgeon holding the extremity of the cord himself with the left fore-finger and thumb, while his right-hand was employed in raising the mouths of the vessels, in order that an assistant might tie them with small ligatures. *

That part of the operation which has for its object the taking of the diseased testicle out of the scrotum, whether it precede or follow the division of the spermatic cord, is extremely simple. It merely consists in dividing the loose cellular substance which connects the testicle with the inside of the scrotum; and in performing this easy task, it is proper to incline the edge of the knife towards the tumour, which, after the division of the cord, may be considered as dead, and destitute of sensation.

When the diseased testicle is much enlarged, it is reckoned advantageous to remove a part of the distended scrotum, because a considerable quantity of loose flabby skin makes it difficult to put the edges of incision evenly together, and is apt to serve as a lodgment for matter.† The manner of executing this object consists in including the portion of the scrotum that is to be taken away in two elliptical incisions, the length and interspace of which must be regulated by the magnitude of the swelling. Then the spermatic cord having been divided, and the arteries secured, the diseased organ is to be dissected out, the incisions being extended on each side from the elliptical cuts already made.

Also when a part of the scrotum is ulcerated, thickened, or adherent to the testis, two semilunar, or elliptical incisions are to be made, which meet together above and below, and include the diseased part of the skin, which is not to be separated from the swelling, but taken away with it.

When the sarcocele is very large, it may lie so close to the sound testis and the penis, that, if attention be not paid to the circumstance, and the knife be too freely used, both these parts may be injured. Sometimes, the enlarged testis approaches very near

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* See Œuvres Chir. de Desault, t. ii. pp. 454, 455.

† See Sharp's Treatise of the Operations, p. 51. edit. 3.; Bertrandi, Traité des Opérations de Chirurgie, p. 209. Paris, 1784.

the urethra, and, without care, this passage may actually be wounded in the detachment of the tumour from its surrounding connections. When the swelling is of considerable size, it presses closely against the septum scroti which is then very liable to be wounded, and the tunica vaginalis of the sound testicle opened; an accident, which may produce a good deal of inflammation, and therefore ought to be attentively avoided.* Former surgeons had great apprehension of wounding the septum scroti, and the common warning, vociferated in the operation, used to be "take care of the septum scroti:" but the truth is, if it were not for the chance of laying open the opposite tunica vaginalis, and doing mischief to the sound testicle at the same time, a wound of that part, which is merely condensed cellular substance, would be of trivial importance.

There is no surer way of avoiding the foregoing inconveniences, than being particularly attentive, in the dissection of the diseased testis out of the scrotum, always to incline the edge of the scalpel towards the swelling; a method, which was invariably followed by Desault, because when the trunks of the spermatic nerves had been divided together with the rest of the cord, the inclination of the knife towards the diseased testis appeared to him the least painful mode of proceeding.

As far as my own experience reaches, the most troublesome bleedings which happen after castration, proceed not from the spermatic arteries, but from the vessels within the scrotum. Hence, I cannot too urgently recommend the surgeon to tie every considerable artery of the scrotum as soon as it is cut †; for, if this plan be not adopted, the vessels quickly retract amongst the loose cellular texture of the part ‡, and though they will bleed again largely soon after the closure of the wound, they stop for a time just when the separation of the testis is completed, and baffle the utmost endeavours of the surgeon to find them. In particular, the artery of the septum scroti, which is much larger than natural in cases of sarcocele §, and often of greater size than the spermatic artery itself ||, will generally require a ligature. The ligatures here used should be made of fine dentist's silk, and cut short after their application, as the wound always suppurates more or less, and the small fragments of silk contained in it constantly come away with the discharge, without the slightest inconvenience.

The operation being finished, the last business is to dress the wound. In this country, it has been the practice, ever since the time of Mr. Pott, to endeavour to heal as much of the wound

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[*] See Richter's Anfangsgr. der Wundarzn. b. vi. p. 162.

[†] Desault, Œuvres Chir. t. ii. p. 451. This eminent operator regularly adopted the method for another reason, which was, that it prevented all obscurity as to the parts which he afterwards cut, the wound being free from blood.

[‡] Dict. des Sciences Med. t. iv. p. 274.

[§] Petit, Traité des Mal. Chir. t. ii. p. 524.

[||] Flajani, Collezione d'Osserv. t. ii. p. 151.

as possible by the first intention. With this view, the edges of the incision are brought together, either with strips of adhesive plaster alone, or with these, assisted by one or two sutures. A pledget is then to be applied over the wound, and the contact of the parts further promoted, by laying suitable compresses over each side of the incision, and supporting the whole with a T bandage. It must be acknowledged, that union by the first intention is here attempted under very unfavourable circumstances, as it is difficult to maintain the parts in exact contact, and the scrotum, deprived of the enlarged testis, forms a cavity, in which it is hardly practicable to hinder suppuration. Some of the modern French surgeons are inclined, therefore, to deny the advantage of the above mode of dressing the wound, and in Paris, the old plan of filling the scrotum with charpie, and letting the parts suppurate and granulate, is still very commonly adopted.* It is true, complete union by the first intention, is seldom or never accomplished, yet, by attempting it, the wound is much diminished, and the cure is rarely delayed later than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven or eight weeks. †

Sometimes, after the patient is put to bed, a hemorrhage takes place; and, frequently when the wound is opened, no particular bleeding point can be discovered. I have generally found the application of cold water to the scrotum, by means of wet linen, placed over the adhesive plaster, the best way of checking this kind of hemorrhage. Should this plan be unavailing, however, as is sometimes the case, the dressings must be taken off, and the bleeding vessel looked for, and tied. Such hemorrhage from the arteries of the scrotum may proceed to a very hurtful, and even dangerous degree, without being suspected; for, the blood flows out of the lower angle of the wound, over the patient's thigh, into his bed, while the outward dressings are perfectly dry and unstained. During the first twenty-four hours after the operation, therefore, the part of the bed under the scrotum should be from time to time felt and examined, in order that no concealed hemorrhage may be allowed to continue. ‡

When severe inflammation follows castration, venesection, leeches, and other antiphlogistic remedies are indicated; while much disorder of the nervous system, great pain in the wound, spasms, restlessness, &c. require the use of opium and emollient poultices. Tetanus, retention of urine, convulsions, incessant vomiting, tension and swelling of the belly, peritonitis, abscesses in the course of the cord, delirium, and incurable fits of epilepsy, were more common after castration in former times, when it was the custom to include the whole of the spermatic cord in the ligature.

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* Roux, Parallèle de Chirurgie Angloise avec la Chirurgie Françoise, p. 120, &c. 8vo. Paris, 1815.

† J. Cross, Sketches of the Medical Schools of Paris, &c. p. 144.

‡ Richter's Anfangsgr. b. vi. p. 163.

Possibly, in a few examples, the alleged evils might not depend immediately upon this mode of tying the cord, because the symptoms sometimes first came on after the separation of the ligature [*]; and there is no reason why this operation should not on other accounts be sometimes followed by tetanus, and other bad consequences, just like the generality of other severe operations. But, as the fact is established, that all these dangers are less frequent, after the modern improved method of removing a diseased testis, than they were after the old plan of operating; while many cases on record also prove, that the above-mentioned bad symptoms have often been suddenly appeased by simply cutting and taking away the ligature [†]; we have the most unequivocal evidence, that such application of the ligature to the whole cord has frequently been the immediate cause of all the patient's danger and suffering.

I have not ventured to load the present chapter with an account of every artifice suggested for stopping the bleeding from the spermatic arteries, without applying a tight ligature on the whole cord. My own observations have convinced me, in opposition to the sentiments expressed by Acrel [‡] and Loder, that the vessels of the cord may be easily taken up with the forceps or tenaculum, and separately tied; and this opinion is also confirmed by the statements of what others have seen and done. [§]

After the operation, the upper part of the spermatic cord occasionally swells so considerably, that it becomes strangulated by the abdominal ring, and vast suffering is the consequence. Authors state, that this case may require a division of that aperture. [||] However, the present manner of securing the vessels of the cord, supersedes all occasion for this practice, because tying them separately never produces so considerable a swelling of the cord as used to be sometimes an effect of the inclusion of the whole of it in the ligature.[¶]

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[*] Morand; Mursinna; Loder, Chir. Journ. b. i.

[†] See cases in the Chirurgical Work of B. Gooch, vol ii. p. 240. 8vo. Lond. 1792; Petit, Traité des Maladies Chir. t. ii. p. 528, &c.

[‡] Acrel, Chirurg. Vorfälle, b. i. s. 447; Loder, Chirurgisch-Medicinische Beobachtungen, p. 111. 8vo. Weimar, 1794.

[§] See Œuvres Chir. de Desault, t. ii. pp. 451—455. C. Bell's Operative Surgery, vol. i. p. 229. "M. Roux (says another modern writer) took up all the arteries with a pair of dissecting forceps, and he did this exceedingly well, never once letting the instrument slip off them." See Cross's Sketches of the Medical Schools of Paris, p. 141.; also Sir Astley Cooper's Lectures, vol. ii. p. 161.

[||] Bertrandi, Traité des Opérations, p. 209.

[¶] Sabatier de la Médecine Opératoire, t. ii. p. 302.

CHAP. XLI.

CIRSOCELE AND VARICOCELE.

THE latter term implies nothing more than a preternatural dilatation of the blood-vessels of the scrotum. These, like the vessels in other parts of the body, are liable to become varicose; but they are seldom so much enlarged as to be troublesome.

Cirsocele is a varicose enlargement of the spermatic veins, frequently producing great uneasiness, and sometimes a wasting of the testicle. It is commonly limited to that part of the cord, which is below the abdominal ring; and the vessels are generally larger, the nearer they are to the testicle. It is attended with a sense of weight in the scrotum; an unequal knotty swelling; and, if the disease affects the whole corpus pampiniforme, with a feel that seems to arise from a bundle of ropes, or earthworms. The disease generally begins at the lower part of the spermatic cord by the side of the testis. Excepting the uneasy sensation of weight in the scrotum, and a little tenderness when pressed, a recent cirsocele is productive of little inconvenience. But, in an advanced stage of the disease, severe pains gradually come on, sometimes extending up to the back and loins, and down the thigh. The case does not invariably make the kind of progress above described: it is often confined to the spermatic cord, or epididymis; and it has been known to continue in this state for many years, without increasing, notwithstanding the patient's employments were of a nature very likely to aggravate the disease. Standing long at a time, walking, horse-exercise, great exertions of the lungs, and every thing requiring forcible expirations, always augment the turgidity of the veins, and the painful sensations experienced by the patient. The weight of the testis, when this organ is not wasted, appears also to have a similar effect.*

This disease is more frequently than any other disease mistaken for an omental rupture. A friend of mine, who was in the army in Bengal, put himself to the expence of returning to England, in consequence of his having been told by the surgeons in India that he had a rupture, while his complaint was only a cirsocele, unaccompanied with any severe symptoms. When nothing is done for the relief of this complaint, it gradually enlarges, and extends upwards towards the abdominal ring. At length, the thickening and dilatation of the whole venous and cellular texture of the cord attains such a degree, that the ring itself seems dilated. In this state, the disease is particularly apt to resemble an omental hernia. As the tumour now extends into the ring, while this is also enlarged, there may be an appearance, as if the parts actually protruded from that opening; and, since, in this advanced stage of the disease, the veins always contribute very much to the swelling, this, like an omental rupture, undergoes a considerable increase, when the patient remains a good while in the standing posture, coughs, or holds his breath, and it subsides, when he lies down for any length of time. Sometimes, like a hernia, the swelling even admits of being partly pressed up into the abdomen.

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* Delpech, Précis Elémentaire des Mal. Chir. t. iii. p. 266.

A little attention, however, will enable the surgeon easily to distinguish the two diseases. In the first place, an enquiry into the history of the case from its commencement, will elucidate the question; from such enquiry, it will be learnt, that the swelling first appeared at the lower part of the scrotum, and had no connection with the abdominal ring. The peculiar sensation felt by the patient, when the tumour is pressed upon, and, in some cases, the wasted state of the testis, are other circumstances, which will leave scarcely a doubt of the disease being a cirsocele. Lastly, it may be remarked, that the increase and diminution of the swelling happen quite differently from what they do in an omental rupture. Cirsocele, under the circumstances above specified, not only enlarges or diminishes very slowly, but, whilst it is increasing, or subsiding, nothing can be felt descending or ascending through the abdominal ring by the surgeon's finger, while kept upon that opening. When two of the fingers are firmly applied to the same aperture, the swelling enlarges from the accumulation of blood in the veins; but nothing is felt falling down, as would be the case, if the disease were a hernia. In addition to these marks of discrimination, it is to be recollected, that various symptoms of an omental rupture are here absent.* The direction, which Sir Astley Cooper gives for avoiding mistakes, is simple and good; the patient is to be placed in a horizontal posture, and the swelling emptied by pressure; the surgeon is then to put his fingers firmly upon the abdominal ring: if the case be a hernia, the tumour cannot reappear, as long as the pressure is continued at the ring; but, if the disease be a cirsocele, the swelling will appear again with increased size, on account of the return of blood into the abdomen being prevented by such pressure.†

A cirsocele may be really combined with a hernia; a case which is extremely perplexing, because the former complaint renders the patient incapable of wearing a truss.

The generality of surgical writers impute the origin of this disease to circumstances, which they think calculated to produce either a relaxation of the seminal vessels, a greater determination of blood to the parts of generation, or an impediment to the easy return of the same fluid from the testis through the spermatic veins. Hence, excessive indulgence in venery; a severe bruise of the groin*; any thing retarding the flow of blood through the lower vena cava; a sedentary life; and the pressure of an ill-made truss upon the spermatic cord, are particularly specified as conducive to the disease. It has also been asserted, that the complaint most frequently affects the left testicle; a circumstance, which is attempted to be explained by the pressure made by the sigmoid flexure of the colon upon the spermatic vessels in its distended state.† It is not clear, that any thing very certain is known, concerning the periods of life most liable to the complaint. One good author informs us, that young persons are more liable to it than adults‡; while another, of equal repute, assures us, that it is commonly met with in adults and old subjects, and but rarely in young persons.§ I have seen the disease in patients both young and old, though never in children: the case mistaken for omental hernia, and on that account sent home from India, took place in an officer not more than eighteen years of age.

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* Richter, Anfangsgr. b. vi. p. 168.

† See A. Cooper's Anatomy and Surgical Treatment of Inguinal and Congenital Hernia fol. Lond. 1804.

An entire cure can seldom be effected. When the disorder occasions pain, cold astringent lotions should be applied over the testicle and cord; blood should be repeatedly taken away by means of leeches; the bowels kept gently open; the patient placed in a horizontal posture; and the testicle supported with a bag-truss.

In ordinary cases, supporting the testicle with this kind of suspensory bandage, is the only thing, to which the patient finds it necessary to attend.

One can hardly suppose a case so severe, and incapable of palliation, as to require the performance of castration, though such instances are mentioned by very good authors. Thus, we have upon record an example, in which a cirsocele followed a violent blow upon the groin. The immediate consequences of the injury were appeased by antiphlogistic remedies; but, after two or three months, the pain in the spermatic cord, which had never been entirely suppressed, became considerably more violent; affecting also the loins and testicle; the testicle itself being diminished, and the epididymis enlarged. Notwithstanding every means, external and internal, the sufferings increased, and became so insupportable, that the patient could get no rest, without the constant use of opiates. Hence, castration was done, and a speedy cure ensued.¶

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* See Case recorded by Gooch, in his Chir. Works, vol. ii. p. 244.

† Petit Traité des Maladies Chir. t. ii. p. 501. 8vo. Paris, 1774.

‡ Lassus, Pathologie Chir. t i. p. 346. 8vo. Paris, 1809.

§ Delpech, Précis Elémentaire des Maladies reputées Chirurgicales, t. iii. p. 266. 8vo. Paris, 1816.

¶ See the Chirurgical Works of B. Gooch. vol. ii. p. 244. 8vo. Lond. 1792.

CHAP. XLII.

HERNIA HUMORALIS, OR INFLAMED TESTICLE.

SYMPTOMS.

The first symptom is generally a soft, pulpy fulness of the body of the testicle, which is exceedingly tender. The fulness increases to a hard swelling, accompanied with considerable pain. The hardest part is commonly the epididymis, and principally the lower portion of it, as may be distinctly felt. The spermatic cord is often affected, and particularly the vas deferens, which is thickened, and, when touched, very tender and painful. The spermatic veins sometimes become varicose; colic pains may be experienced in the bowels; and sickness is a common symptom, and even vomiting. In some cases, a great accumulation of air takes place in the alimentary canal, producing much oppression and inconvenience.* The bowels in other instances are obstinately constipated, and if this symptom be conjoined with incessant vomiting, a large tumour of the scrotum, and great swelling and thickening of the spermatic cord, the case may partly resemble a hernia, from which, however, a surgeon, well acquainted with all the characters of the latter disease, will have no difficulty in distinguishing it. A severe pain in the loins is usually attendant on the complaint. In addition to the preceding complaints, the patient, in severe cases, has a great deal of symptomatic fever, pain shooting down the thighs, and considerable heat and difficulty in making water. The scrotum, in consequence of the distention which it suffers, becomes smooth, loses its corrugated appearance, and is redder than in the healthy state. The disease rarely affects both testes at once; though, as Mr. Hunter observes, it sometimes happens, that the swelling changes from one of these organs to the other with surprising rapidity.† In slight cases, the vas deferens and epididymis may be affected alone ‡; but, in all usual examples, the body of the testis is equally implicated. Any man, says Mr. Hunter, who is accustomed to know the difference between a swelling of the whole testis, and that of the epididymis only, will immediately be sensible, that in hernia humoralis the whole testis is commonly swelled. This organ assumes the same shape that it does from other causes, where we know from being obliged to remove it, that the whole has swelled, and the pain is in every part of it. Mr. Hunter has seen hernia humoralis suppurate at the anterior part of the swelling; he has known several instances, in which the complaint produced adhesions between the tunica albuginea and tunica vaginalis, as was discovered after death, or in the operation for a partial hydrocele. Such changes, says he, could not have taken place, if the body itself of the testis had not been inflamed.*

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* See a Treatise on the Venereal Disease, by John Hunter, p. 54. 2d. edition, 4to. Lond. 1788.

† On the Venereal Disease, p 54.

‡ Richter, Anfangsgr. b. vi. p. 171.

A bruise may occasion a hernia humoralis: we see it purposely caused by the surgeon, when he undertakes the radical cure of a hydrocele. But, of all the various causes of this complaint, by far the most frequent is irritation in the urethra. Hence, it more frequently arises in consequence of a gonorrhœa than any other cause; and persons with bad strictures, for which they are using bougies, are also particularly exposed to its attack. It is commonly thought, that, in cases of gonorrhœa, a swelled testicle occurs with particular frequency, when the patient takes too much exercise, employs stimulating injections, drastic purgatives, or indulges in coition and spirituous drinks. It is also believed, that the complaint is less likely to happen, when the scrotum is well supported with a bag-truss, during the continuance of the discharge from the urethra. It is very remarkable, that, in cases of gonorrhœa, the pain in making water, and the quantity of purulent discharge from the urethra, are almost always very suddenly diminished, as soon as the testicle begins to enlarge; the discharge, indeed, being frequently quite stopped. This curious circumstance has attracted a great deal of attention, and has been repeatedly adduced, by theorists, as a proof of the *metastasis* of a disease, or of a sympathy between the testicle and urethra. The latter sentiment was espoused by Mr. Hunter and Girtanner, and is what is at present entertained by the generality of modern surgeons: the arguments in its support are indeed both numerous and weighty. Inflammation of the testicle is sometimes manifestly excited by simple local irritation in the urethra, as by the introduction of a bougie. Certain inflammatory swellings of the inguinal glands are commonly acknowledged to be nothing more, than sympathetic effects of local irritation in that canal. Most of the authors who believed in the doctrine of hernia humoralis being a consequence of the translation of the matter of gonorrhœa from the urethra to the testicle, believed also that such matter was impregnated with the syphilitic virus. Yet, their credulity ought to have been shaken, when daily experience revealed to them, that the inflammation and swelling of the testicle ultimately subsided, without ever being followed by any other secondary symptom, which would often have ensued, even according to what we now know of syphilis, had the complaint truly arisen from the venereal poison really attacking the part. These ready believers ought at least to have hesitated in making the inference which they did, when it was well known to them, that a hernia humoralis never originated from a syphilitic chancre, although, in this particular case, other parts, at a greater or lesser distance from the sore, did really have the effects of the virus thrown upon them by the action of the absorbents.

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* Hunter, on the Venereal Disease, p. 55.

Perhaps, at the present day, the curability of the disease without mercury would not be allowed to have much weight in deciding whether the case were syphilitic, or not; but, it is surprising, that it had not more influence in less enlightened periods, when it was not uncommonly supposed, that no form of the true venereal disease could be eradicated, without the aid of its great reputed specific, mercury. That the swelling of the testis could not arise from syphilis *, might have been inferred from the consideration, that the tumour often came on quite suddenly, and as suddenly disappeared, or shifted to the other testicle; and that it often subsided with wonderful rapidity on the removal of the irritation in the urethra, or the exhibition of an emetic. It might also have been seen, that, in certain instances, the clap did not stop until the testis had been affected some days; nor would anatomy have warranted any supposition of the existence of a set of absorbent vessels, whose course qualified them for conveying the matter of gonorrhœa directly from the urethra to the testicle. †

Although it would appear, that a hernia humoralis, in cases of gonorrhœa, is frequently a sympathetic effect of irritation in the urethra upon the testis, there is some reason for suspecting that this not invariably the case. Thus, as Mr. Hunter remarks, as singular a circumstance as any, respecting the swelling of the testicle, is, that it does not always come on when the inflammation in the urethra is at its height. He thought, indeed, that it oftener happened, when the irritation in the urethra was going off; and, sometimes, even after it had entirely ceased, and when the patient conceived himself to be quite well.‡ Sometimes the swelling of the testis occurs, without any stoppage of the running. In certain examples, the patient has no painful sensations in the urethra; and the affection of the testis has been known to commence as late as a fortnight after the gonorrhœa and all its usual symptoms had entirely ceased. ||

Another mode of accounting for this not unfrequent inflammation of the testis in cases of gonorrhœa, is, by supposing the irritation to be propagated from the mouth of the vas deferens successively to the spermatic cord, epididymis, and the body of that gland. But, the truth of this conjecture is doubted by Hunter, on the ground, that a hernia humoralis is as frequent in cases where the inflammation extends only a little way along the urethra, as in other cases, where it reaches further, and the mouths of the vasa deferentia must be more or less inflamed. He thought also, that,

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* Mr. Hunter assures us, that, as far as his experience goes, the testis is never affected with the venereal disease, either local, or constitutional. See Treatise on Venereal Disease, p. 56.

† Richter, Anfangsgr. b. vi. p. 172.

‡ Treatise on the Ven. Disease, p. 56. edit. 2.

|| Swediaur.

if this explanation were correct, both testes ought to be more commonly affected together.

Leaving these abstruse points to the consideration of such readers as may feel inclined to theorize further upon the subject, I shall rest contented with merely knowing and mentioning the fact, that, in cases of gonorrhœa, the occurrence of hernia humoralis is usually attended with a sudden, and considerable, diminution, and even a total cessation, of the strangury, and discharge from the urethra. This amendment, in the latter complaint, generally continues till the vehemence of the hernia humoralis has abated, and then the pain in making water, and the copious discharge, frequently recur.

Inflammation of the testicle, however, is a complaint remarkable for its irregularities. In a few cases, the swelling of the testicle, instead of being followed by any diminution of the discharge from the urethra, as is most common, is immediately succeeded by a return of the running with increased violence, which remains as long as the hernia humoralis itself.*

TREATMENT OF HERNIA HUMORALIS.

The patient should be kept perfectly quiet, and in a horizontal posture in bed. If he be young and robust, the swelling of the part considerable, and the pain in the loins violent, phlebotomy may be practised; the quantity of blood taken away, and the repetition of the operation being determined by the patient's ability to bear the evacuation, and by the state of the local disease. In very severe cases, where yet the stomach was quiet, I have frequently prescribed nauseating doses of tartarized antimony, with decided advantage. In almost every case, bleeding with leeches is to be repeatedly put in practice, and saline purgative medicines administered. With regard to local applications, as far as my own observations extend, fomentations and poultices prove more beneficial than cold astringent lotions. But, an object, of the highest importance, is to keep the testicle constantly supported, by means of a bag-truss, or suspensory bandage, which often relieves the violent pains in the back and thigh immediately it is put on.

Mr. Hunter states, that emetics have been known to remove the swelling almost instantaneously. Without giving full credit to the literal meaning of this observation, it is very certain, that the great degree of swelling, in cases of hernia humoralis, often occurs and subsides more rapidly, than that of any other inflammatory affection whatever.

When the pain in the part and loins is unusually severe, opiates become necessary.

After the inflammation is completely subdued, the hardness of the epididymis commonly remains. Sometimes, it may be lessened by frictions with camphorated mercurial ointment, or the use of discutient plasters; but, in general, more or less of it continues during life. Mr. Hunter suspected, that, in some testicles, which remain indurated at the epididymis, the latter canal is impervious, and the organ of course totally useless. This kind of hardness is in other respects not at all disposed to give trouble, or degenerate into a malignant disease, or extensive sarcocele, affecting the whole of the testis. At least, experience proves, that such consequences are very rare.

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* J. Hunter, op. cit. p. 55.

Inflammation of the testicle sometimes, but not often, terminates in suppuration; and the matter may be situated either in the cellular membrane of the scrotum, within the tunica vaginalis, or in the substance of the testis. When the abscess is evident, there should be no delay in opening it. Small suppurations of the testis are alleged not to unfit the part for its function in the animal economy.[*] When the pulpy substance of this organ is affected, the tubuli testis of which it is composed are said to be liable to be discharged with the matter, in the form of grey stringy particles; and the more of it the surgeon draws away, the smaller the testis becomes, so that at length, if this plan be followed up, the tunica albuginea is left by itself quite empty, with the remaining epididymis.[†]

CHAP. XLIII.

OF CANCER SCROTI; CHIMNEY-SWEEPERS' CANCER; OR SOOT-WART.

THE chimney-sweepers' cancer was first described by the celebrated Mr. Pott. It is said to be endemial in this country; a circumstance, that is ascribed to the particular kind of soot which arises from the vast quantities of sea-coal here consumed as fuel. At all events, the disease has never been noticed in France [‡]; and Ramazini, who published on the disorders to which workmen are particularly exposed, makes no mention of the cancer scroti.

This disease almost always makes its first appearance in the inferior part of the scrotum, where, as Mr. Pott observes, it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges. With the exception of one case, which was shown to him by Sir J. Earle, and which occurred in a child under eight years of age*, that eminent surgeon never saw the complaint occur under the age of puberty. According to Mr. Earle, as the disease advances, the parts immediately contiguous to it become affected; it spreads downwards to the perinæum, and, if not arrested, will include the whole scrotum, and not unfrequently one or both testicles. When the testicle is first affected, it becomes firmly connected with the diseased scrotum, enlarged, and considerably indurated. Ulceration, and sometimes sloughing, then take place, leaving a deep excavated ulcer, that penetrates into the body of the testis, which does not appear disposed to throw out a fungous growth. Another very important remark, made by Mr. Earle, is, that when the inguinal glands are enlarged, they will generally subside after the removal of the diseased scrotum.† Lastly, the disease extends up the spermatic cord to parts within the abdominal ring, and then is very soon painfully destructive.

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[*] Richter, Anfangsgr. b. vi. p. 178.

[†] See Petit, Traité des Maladies Chir. t. ii. p. 513, &c. 8vo. Paris, 1774. Also, Mém. de l'Acad. de Chir. t. iv.; and Morand, Opuscules de Chir. 4to. Paris, 1768.

[‡] Richerand, Nosographie Chirurgicale, tom. iv. p. 290. edit. 2.

It is supposed, that this terrible malady commonly derives its origin from the lodgment of soot in the rugæ of the scrotum. Hence, at first, it must be entirely of a local nature.

It is proper to observe, that though this peculiar disease hardly ever occurs, except on the scrotum, two rare examples have been recorded by Sir J. Earle, in which the distemper happened in other situations. In one instance, it attacked the face; in another, it took place on the back of the hand.‡

Mr. Pott believed, that the disease was confined to chimney-sweepers; but Sir J. Earle met with it in other descriptions of persons, in whom, however, the origin of the complaint was traced to the action of soot.

If there be any chance of putting a stop to the above mischief, it must be the immediate removal of that part of the scrotum where the sore is; for, if it be suffered to remain until the testicle becomes affected, the performance even of castration will generally be too late. Mr. Pott informs us, that he had often made the experiment, and that though the wound made by such operation sometimes healed favourably, yet, in the space of a few months, the patients generally returned either with the same disease in the other testicle, or in the glands of the groin, or with such a diseased state of the viscera, as soon ended in a painful death.

The cases, which Mr. Earle has seen, lead him to adopt the opinion, that where the inguinal glands are affected, the operation ought still to be performed; and, as he has seen two lasting recoveries follow the removal of the diseased parts, even where the testis was involved, he approves of the attempt, provided the spermatic cord be sound.§

I have seen several cases of this disease in St. Bartholomew's hospital, but never knew one instance which was materially benefited by any medicines, or topical applications: I am, therefore, strongly impressed with the propriety of an early removal of the affected part of the scrotum. The loss of a portion of this part can never be attended with future inconvenience; and, as Mr. Pott most justly observes, it is a very good and easy composition for the preservation of life.

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* See Pott's Chirurg. Works, by Earle, vol. iii. note, p. 178. edit. 1808.

† Med. Chir. Trans. vol. 12. p. 297.

‡ Lib. cit. pp. 178—182.

§ Vol. cit. p. 301.

The operation, when done under the most favourable circumstances, will not always succeed: a patient, whose testicle was still unaffected, and his general health apparently unimpaired, died a month after the removal of the diseased part, with violent pains and great tension of the abdomen.*

When the disease has made too much progress to admit of extirpation, only palliative treatment can be pursued, and such medicines and applications as are recommended in the chapter on cancer may be employed.

CHAP. XLIV.

GONORRHŒA, OR CLAP.

When an irritating matter of any kind is applied to a secreting surface, the natural secretion becomes increased in quantity, and altered in quality; and when the ordinary mucous secretion of the urethra in men, or of the meatus urinarius, nymphæ, &c. in women, is, in this manner, changed into a fluid, resembling pus, the disease is named a *gonorrhœa*, or *clap*.

The complaint has been supposed to arise from the application of venereal matter to the urethra. A preternatural discharge from this passage, however, may result from any kind of irritation affecting it; and no doubt can be entertained, concerning the frequent origin of claps from the mere contact of various kinds of acrid and infectious discharges with the urethra, labia, nymphæ, &c. in coition. Altered secretions of these kinds may be formed from the mucous surfaces of the parts of generation in either sex, totally unconnected with the poison of syphilis. Strictures, and the employment of bougies, are both very frequent causes of what may be termed a gonorrhœa. Indeed, that various discharges from the urethra, attended with pain, and a sense of scalding in making water, were common, prior to the period not unfrequently assigned for the introduction of the venereal disease into Europe, is a fact, of which irrefragable confirmations exist. Whether a species of gonorrhœa exists, which is truly syphilitic, is yet a contested point.

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* Richter's Chir. Bibl. b. v. p. 130: This case was one which Dr. Michaelis had an opportunity of seeing when he was in England.

When the complaint follows some kind of contamination, received in coition, it usually begins about six, eight, ten, or twelve days afterwards; but it is capable of affecting some persons much sooner, and others much later. The first symptom is usually an itching at the orifice of the urethra, sometimes extending over the whole glans penis. A little fulness of the lips of the urethra is next observable. Very soon after the discharge has appeared, the itching changes into pain, especially at the time of voiding the urine. The penis, and particularly the glans, are affected with swelling. The latter part has a transparent appearance around the mouth of the urethra, the skin seeming distended, smooth, and red, like a ripe cherry. Sometimes the glans, as well as the beginning of the urethra, is more or less excoriated. This canal becomes narrower, as is proved by the stream of urine being smaller than common; a circumstance, which the believers in the muscular power of the urethra would ascribe to two causes, viz. the swollen state of the lining of the canal, and its spasmodic contraction; while others, who deny the existence of any muscular power in the membrane of the urethra, would account for the diminished diameter of the canal altogether by the effects of the swelling and thickening of its lining, the distention of the corpus spongiosum, and perhaps the action of the muscles about the perineum. Small swellings are often observable along the lower surface of the penis, in the course of the urethra, and were suspected by Mr. Hunter to be enlarged glands. In some instances, Cowper's glands in the perineum inflame and suppurate.

The natural discharge from the urethra is first changed from a transparent viscid secretion, to a watery, whitish, pellucid fluid; and this, becoming gradually thicker, assumes the appearance of pus. The matter often changes its colour and consistence; sometimes, it is almost white; sometimes, quite yellow; and, in other instances, greenish.

In ordinary cases, the affection of the urethra does not extend far along this canal from its orifice; perhaps not farther than an inch and a half, or two inches: this was, what Mr. Hunter named, the *specific extent* of the inflammation.

Besides the symptoms already mentioned, a very acute, scalding pain is experienced in making water, which frequently can only be discharged by drops, or in an extremely small, broken stream. The bladder being also very irritable, the patient is incessantly troubled with a feel as if he wanted to make water, and is obliged to be repeatedly emptying that organ of what little collects in it.

In the neighbouring parts, a variety of other affections are occasionally produced: as pain, soreness, and uneasiness, all over the pelvis; and the scrotum, testicles, perineum, anus, and hips, may become disagreeably sensible. The testicles often require to be suspended in a bag-truss, and are so irritable, that the least exertion makes them swell. The inguinal glands may inflame and enlarge, producing the kind of swelling termed a *sympathetic bubo.* In many instances, the patient is obliged, almost every five minutes, to make water with violent pain, not only in the bladder itself, but in the glans penis; the pain frequently continuing after the urine has been discharged.

OF THE POWER OF THE MATTER OF GONORRHŒA TO COMMUNICATE THE VENEREAL DISEASE.

That many ordinary discharges from the urethra in men, and from the surfaces of the labia, nymphæ, meatus urinarius, &c. in women, have no connection with syphilis, is a truth, which I take to be at present generally admitted. But, whether there may not be a particular species of gonorrhœa, which arises as an effect of the application of syphilitic matter to the secreting surfaces above specified, and which is even capable of producing secondary syphilitic effects, in consequence of absorption, is a question that is by no means universally and finally settled. The arguments, which have been broached in support of this doctrine, are; first, the probability, that the Otaheiteans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for, these could hardly be supposed to have a chancre during a voyage of five months, without the penis being destroyed. Secondly, Mr. Hunter mentions a gentleman, who had a gonorrhœa thrice, of which he was cured without mercury. About two months after each infection, he had symptoms of lues venerea. The first were ulcers in the throat; the second were blotches on the skin: both which forms of the disease yielded to mercury. Thirdly, two punctures were made on the penis, with a lancet dipped in the matter of a gonorrhœa. One of these produced, on the part of the prepuce, where it was made, a red, thickened speck, which increased and discharged purulent matter. This supposed chancre healed, on having its surface repeatedly destroyed with caustic. The other puncture was made on the glans, where it was followed by a pimple, full of yellowish matter. This pimple was touched with caustic, and healed in the same way as the sore on the prepuce. Four months afterwards, the chancre on the prepuce broke out again; then it healed, but once more returned. This course it followed several times; but always healed without any application to it.* While the sore remained on the prepuce and glans, a bubo formed in the groin. A sufficient quantity of mercury was given to cure the gland locally; but not to prevent the constitution from being affected. Two months after the cure of the bubo, a venereal ulcer, according to Mr. Hunter, formed on one of the tonsils. This was cured by mercury; but the medicine was purposely left off as soon as the sore was skinned over, in order to see what parts would next be affected.

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* These ulcerations, inferred by Mr. Hunter to have been venereal, and yet described by him as having healed without any thing being done to them, prove very unequivocally, that this great man knew perfectly well, that true chancres might be healed, not only without mercury, but without the use of any particular local applications.

About three months afterwards, copper-coloured blotches made their appearance in the skin, and the ulcer on the tonsil recurred. This disease was again only palliated by mercury; but the complaints returned in their former situation; and were ultimately cured by a proper quantity of mercury.

On the other hand, doubts must exist, concerning this account of the effects of the matter of gonorrhœa, when the following circumstances are taken into consideration: —

1st. It is impossible to say, what time may elapse between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio de la Plata; but, actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite. At the same time, it must be sufficiently obvious, that every pretended elucidation of the mode, in which the venereal disease was communicated to the natives of Otaheite by European visitors, has its importance seriously lessened by the reflection, that the assumed fact of this disease having been first imparted to the Otaheiteans by European sailors, is quite as doubtful and unproved, as the common doctrine concerning the first origin of syphilis in Europe at the famous siege of Naples; or the opinion, that the distemper was brought from the new to the old Continent by the followers of Columbus. Who can presume to infer, that the island of Otaheite had never been visited by diseases of the parts of generation, before the arrival of the French navigators under Bougainville? In order to justify such a belief, the clearest evidence would be absolutely requisite, and this from men, whose visit to Otaheite was early enough for the purpose, and whose professional acquirements made their testimony of value. On a point of this nature, nothing like traditional accounts should be allowed to have undue weight. If the Otaheiteans were never subject to ulcers on the parts of generation, discharges, eruptions, &c. before their intercourse with Europeans, they could have had nothing of human nature, or of the human constitution about them; for it is universally admitted, with respect to all other nations, about whose former state we know any thing, that they were unquestionably subject to diseases of the parts of generation; and the firmest believers in the fabulous descriptions of the first origin of syphilis in Europe, would never deny that such distempers prevailed long before syphilis is imagined by them to have had its existence. Now, if we are warranted in concluding from analogy, that the Otaheiteans had some diseases of the parts of generation, before they had any intercourse with Europeans, it is an undertaking far beyond my compass to investigate what the exact nature of those complaints might be. As for the fanciful origin of the venereal disease in the new world, and its importation into the old, which account, if it were true, might perhaps be construed into strong evidence against Bougainville's crew, inasmuch as there would then be some definite ground for supposing, that it must have got into Otaheite by importation, just as it did into Europe, it is a doctrine liable to many weighty objections. Supposing we were to begin with admitting, either that syphilis was first brought into Europe from America, or that it originally broke out in the French army at the siege of Naples, in 1494, and that it afterwards gradually spread from the parts of Europe primarily infected to the many other countries which have since suffered from it, I do not see, that we advance a single step in the investigation of the causes of the first origin of the venereal disease. Whether the distemper were of American or Neapolitan birth, whence was derived the earliest stock of syphilitic poison? Are we to suppose, that the virus never had but a single source, and that the disease first *spontaneously* broke out only in one unfortunate male or female individual, by whose stock of infection, all the various nations of the world, and all future generations, were to be contaminated? Can the present received doctrines of syphilis be reconciled to this theory of its beginning spontaneously, without any exposure to the specific virus? The venereal disease, unlike many contagions, is not communicable through invisible effluvia in the atmosphere; and cannot extend itself, except by the positive application of the matter of the disease to some part of the body, where the poison first produces specific local effects, frequently followed by other consequences in situations at a greater or lesser distance from the point first affected, which consequences are the result of the absorption of the virus into the constitution. The venereal disease then could never be imparted from contagion in the atmosphere; and, however contrary it may be to modern theories to imagine, that syphilis could arise as it were spontaneously, without the previous contact of the virus, reason must infallibly come to such a belief with respect to the earliest supposed instance of the disease. This fact is itself extremely curious, and involves many interesting reflections, which would carry me beyond my limits. I shall therefore merely add, that, if the disease did originally begin spontaneously, and an ulcer form of itself, capable of secreting syphilitic matter, the same thing may have happened in innumerable other examples, and the complaint, instead of having begun only in America, or in Italy, may have had myriads of self-created sources, and existed in every populous country from time immemorial. On the same principle, an attempt might also be made to account for the varieties of the complaint, and the production of different kinds of infectious matter. Such are the considerations, which forbid me from attaching any importance to the opinion, that gonorrhœa is capable of communicating syphilis, and that it was actually the form of disease, in which the

Otaheiteans had syphilis first communicated to them by European navigators.

2dly. The second argument adduced by Mr. Hunter is certainly inconclusive. Every ulcer in the throat is not regularly venereal. A common ulcer may heal while the patient is using mercury. Hence, the cure, apparently accomplished by this medicine, is no proof that the complaint was syphilitic. 3dly. The last fact of inoculation appears strong, and more imposing. But, though the insertion of gonorrhœal matter, or any other morbid matter, beneath the cuticle, will undoubtedly produce troublesome local complaints, may we not doubt, that the sores, in the above case, were actually venereal? Can we implicitly depend upon the continence of the subject of the above remarkable experiments, during the long space of four months, between the healing of the sore on the prepuce, and its recurrence? If we cannot, the inference, with regard to the power of gonorrhœal matter to communicate the venereal disease, remains unestablished. The experiments might have been less objectionable, in respect to the possibility of a new chancre from a different source, if the inoculation had been practised on another part, instead of the penis. But, really, at the present day, the very circumstance of a sore repeatedly healing up and breaking out again, without the exhibition of mercury, or the use of any particular local applications, would be received by the most intelligent surgeons as a decided proof of the case not being actually syphilitic. With regard also to the secondary symptoms, the sore-throat and eruptions, it would require a more minute account of their appearance, especially of the blotches, to be able to pronounce, whether they had the characters generally now supposed to appertain to the cutaneous effects of syphilis. We know not whether the eruption, for instance, was scaly or not; and, as for the sore-throat, even the deep excavated ulcer of the tonsils, is not now universally admitted as a criterion of syphilis. The fact of the sore in the throat having broken out again, after the patient had taken mercury enough to heal it, and keep it healed for three months, appears to me an argument against its being venereal on the Hunterian principles themselves. Let it be remembered also, that Mr. Hunter's experiments with gonorrhœal matter, have been repeated by others, and, if we are to credit the statements delivered by Mr. B. Bell on the subject, the endeavour to excite syphilis in this manner completely failed. Yet, possibly, the matter discharged from the patient's urethra in Mr. Hunter's cases, might be of a specific nature, and different in its quality from what was employed by other experimenters. In short, the different result of all these experiments naturally leads back to the question, whether there may not be, as Hunter and many others suppose, a gonorrhœa of a specific syphilitic nature, distinct from common simple discharges from the urethra. However, if the matter of gonorrhœa be capable of communicating the venereal disease, why does not the discharge commonly produce chancres on the glans and prepuce, with which parts it must lie in contact a very considerable time in every case? Why also does not the presence of a chancre frequently cause a gonorrhœa? If the infection of one species of gonorrhœa and syphilis, be really of the same identical nature, certainly it is extraordinary, and contrary to what would be expected in the nature of things, that the former complaint should receive no benefit from mercury, while the various forms of the latter disease are acknowledged by all parties, whether they regard this mineral as the grand specific and only remedy for the distemper, or not, to be generally cured by it in less time, and with a smaller chance of relapse, than by any other known means. I shall say nothing in the present place, concerning the sentiment promulgated by Mr. Carmichael, that claps may produce a certain train of secondary symptoms, which he distinguishes by the term of the *papular venereal disease;* it being quite enough here to mark, that, whether this gentleman's views be altogether correct or not, he is to be classed with those writers, who do not consider the poisons of syphilis and gonorrhœa as being of the same identical nature, or capable of giving rise to similar secondary effects.*

TREATMENT.

Gonorrhœa is one of those peculiar diseases, which have no specific remedy; but which, at the same time, have a propensity to get spontaneously well, and gradually wear themselves out. The complaint, in all its forms, is at first evidently of an inflammatory nature; and though we cannot at once effect a cure, we may palliate the symptoms, and shorten their duration, by the early adoption of certain antiphlogistic means.

Linen, wet with a cold evaporating lotion, should be kept constantly applied to the penis. The patient should keep his bowels well open with saline purges; live more abstemiously than common, avoiding spirituous drinks, and all spicy food; and render the quality of his urine as little irritating as possible, by taking in the course of the day, copious draughts of barley-water, mucilage of gum arabic, &c.

After a few days, some attempt may be made to alter the action of the vessels of the lining of the urethra, so that they may gradually be brought to secrete again the healthy mucous fluid, with which the canal is naturally lubricated. For this purpose astringent injections may be applied. The most common is that containing the sulphate of zinc; and, for first use, not more than five grains of this salt should be dissolved in four ounces of water; but, the application may afterwards be strengthened. When this injection has little effect, another one, containing the oxymuriate of mercury, sometimes answers better, one grain of which, in eight ounces of distilled water, will form a fluid sufficiently strong for first employment. Another very good astringent injection, is composed of fourteen grains of plumbi superacetas dissolved in eight ounces of water.

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* See Obs. on the Symptoms and Specific Distinctions of Venereal Disease, 8vo. Lond. 1818. Also, Essay on Venereal Diseases, 8vo. Lond. 1825, 2d ed.

As injections are only temporary applications, it is evident, that they ought to be very frequently used. At first, however, two or three times a day will suffice. The mouth of the syringe should not be pressed against the orifice of the urethra, as it creates a great deal of irritation, and sometimes ulceration.

When the strangury is severe, and there is trouble from nocturnal erections, chordee, &c. opium is to be prescribed.

After the inflammatory stage of the disease is over, the balsam of copaiva, may be exhibited, or cubebs, which, indeed, has been recommended as a specific remedy for gonorrhœa, even in its early inflammatory stage. The dose is a dessert spoonful of the powder an hour before breakfast; a second, six hours afterwards; and a third, at bed-time. The powder is to be taken in water. If given while the discharge is considerable, and the inflammation great, the painful symptoms, it is asserted, will be removed in two days, and the discharge generally terminate on the third or fourth day. An antiphlogistic regimen is to be observed, and it is also necessary to continue the powder, a day or two after the discharge has disappeared.* The, trials which I have made of cubebs, incline me to consider it as having similar virtues to those of the balsam of copaiva.

CHAP. XLV.

GLEET, CHORDEE, SYMPATHETIC BUBOES, BLADDER AFFECTED IN GONORRHŒA.

Sometimes, after the cure of the specific inflammation of the urethra, upon which a gonorrhœa is supposed to depend, or after the removal of all acute inflammation, a discharge still continues, and, though unattended with pain, is often difficult of cure. A gleet is essentially different from a gonorrhœa in not being infectious, and in consisting of a discharge, which is composed of globules, blended with the mucous secretion of the part. On the other hand, in cases of gonorrhœa, the discharge has the power of infection, and is composed of globules, mixed with a serous fluid.

Stimulating injections may be tried. Two grains of the oxymuriate of mercury, dissolved in eight ounces of distilled water, form a very suitable application. Injections frequently produce only a temporary cessation of a gleet, and the complaint soon afterwards recurs: patients, therefore, should not relinquish their use too soon, on the supposition of their being permanently well. It is generally advantageous to continue the use of the injection for two or three weeks, after the complete stoppage of the discharge. In some instances, sea-water makes a more efficacious injection than any other. It was very common formerly to introduce into the urethra bougies, medicated with turpentine or camphor, and about four or five inches long, with a view of irritating the lining of the canal, and altering the mode of action in the vessels. Of late years, however, the practice has gone a good deal into disuse, and this is a strong test of its not having been productive of more benefit than injections, which can be used with less trouble; and the probability is, that its efficacy has been in reality very inferior.

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* See Adam's Short Account of Cubebs, as a remedy for Gonorrhœa, in Edinb. Med. and Surgical Journal, January 1819, p. 61.

At the same time that injections are employed, the surgeon may direct the patient to take thirty drops of the balsam copaiva thrice a day; or the tinctura lyttæ, beginning with a dose of ten drops thrice a day. If these medicines produce no good, though taken regularly for a week or ten days, they may be discontinued, as affording no hope of their becoming useful afterwards. Cubebs is also an exceedingly fit medicine for trial.

Many gleets will not yield to the above plan of treatment. Patients, so circumstanced, may try cold bathing (if possible, in the sea), and rough horse-exercise. If debilitated, they should take bark and steel; and in inveterate cases, electricity, and even blistering the skin underneath the urethra, are recommended. Besides those gleets, which may be considered as the remains, or consequence of a gonorrhœa, there are others, which are of a very different nature, arise from other causes, and cannot possibly be benefited by the kind of treatment which is applicable to cases depending solely upon a wrong action of the secreting vessels of the urethra. The cases which I here refer to, are those which arise from strictures in the urethra, or from disease of the prostate gland. Here the gleet is merely an effect or symptom of the other more serious complaint, upon the removal of which, the cure of the discharge altogether depends. Hence, when the patient consults a surgeon for a gleet of long continuance, it is often prudent, in the first instance, to examine the state of the urethra.

CHORDEE.

In cases of gonorrhœa, when the inflammation is not confined merely to the surface of the urethra and its glands; but affects the reticular membrane, it produces in the latter part an extravasation of coagulating lymph, which unites the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal, in this respect, to the corpora cavernosa penis. Hence, at the time of an erection, a curvature takes place, termed a *chordee.* The concavity of the curvature is generally at the lower part of the penis.

When much inflammation is present, bleeding from the arm, and, more especially from the part itself, by leeches, is proper. The penis should be exposed for some time to the steam of hot water. Camphorated fomentations and poultices are also remedies, of which experience makes a favourable report. At the same time, opium and camphor may be given as internal medicines.

When all inflammation has been subdued, the indication is to promote the absorption of the coagulating lymph; and, for this purpose, nothing is better than frictions on the part with camphorated mercurial ointment.

SYMPATHETIC BUBO.

Gonorrhœa is sometimes attended with a swelling of the inguinal glands, termed a *sympathetic bubo.* This complaint is supposed to originate from mere irritation, and not from the absorption of matter. We know, that the lymphatic glands are capable of becoming inflamed in this manner; for, in various diseases, we see them frequently swell at a more remote situation from the thoracic duct than the local complaint, which is the exciting cause of their enlargement. The pain, which sympathetic swellings of the glands occasion, is much less than that arising from the true venereal bubo, and it was the opinion of Mr. Hunter, that they seldom suppurated.

Whatever may be the nature of a sympathetic bubo, certain it is, that mercury is by no means necessary or useful in the treatment. This is a fact, which may be considered as fully established, and confirmed by the experience of the most intelligent practitioners. The swelling may be diminished by the repeated application of leeches, and by keeping up a continual evaporation from the part, by means of linen, wet with the liquor plumbi acetatis dilutus. In short, the case is to be treated as a simple phlegmonous inflammation. When a poultice is found to afford more ease, than cold applications, it is to be used.

BLADDER AFFECTED IN GONORRHŒA.

Opiate clysters, the warm bath, phlebotomy, if the patient be young and robust, and leeches applied to the perineum, are the most eligible measures to be adopted. When this distressing affection continues very long, and is the only complaint, an opiate plaster may be applied to the loins, or a small blister to the perineum.

Cicuta, bark, and sea-bathing, are also means which deserve trial.

When the bladder is extremely irritable, in consequence of a gonorrhœa, a scruple or drachm of the powder of uva ursi may be given, three times a day.

CHAP. XLVI.

PHIMOSIS.

When the opening of the prepuce is so much contracted, that the part cannot be easily drawn backwards, and the glans penis exposed, the complaint is termed *phimosis*. On the other hand, when the prepuce is pulled behind the glans, over which it cannot be brought forwards again, the case is well known amongst surgeons by the name of *paraphimosis*.

Phimosis is either a defect with which certain individuals are born, or it is the consequence of inflammation of the prepuce. The first of these cases is commonly termed *natural* or *congenital*; the second, *accidental*.

NATURAL OR CONGENITAL PHIMOSIS.

Infants are almost always born with the aperture of the prepuce so small, that the glans cannot be entirely uncovered; but, when such constriction does not exceed a certain degree, it should not be regarded as an imperfection; for it generally gets well of itself, as the child grows up, and approaches the age of puberty, — the period when erections begin to be strong, the penis to elongate itself, and the glans to dilate the prepuce.

This change, however, cannot happen when the opening of the prepuce is exceedingly small, and the frænum very short.

Even when the aperture of the prepuce is not particularly small, too considerable a length of the prepuce may prevent the removal of the constriction, in which case, the part yields in proportion as the penis becomes lengthened in erection, without the glans making any pressure against the contracted extremity of it, which, of course, remains undilated. Provided the urine can be discharged with ease, however, there is no absolute necessity for the opening of the prepuce to be made larger, before the period of life, when nature destines these organs for other functions, and to the performance of which the constriction of the prepuce is a great impediment.

Individuals, who naturally have the opening of the prepuce only half the ordinary size, are liable to another annoyance: the sebaceous fluid, which the glands of the corona glandis pour out, collects under the prepuce, and growing acrid, produces itching, inflammation, and a discharge of matter, very like that of gonorrhœa.

When this form of disease is unskilfully treated, the prepuce sometimes becomes adherent to the glans; a complication, which, from whatever cause it originates, is frequently troublesome and vexatious. Petit details several interesting examples of it.

He was consulted by one healthy young man, for a similar adhesion of the glans to the prepuce, but from a very different cause. The patient, when a child five or six years old, used to wet his bed, and, in order to avoid the birch, and the anger of his parents, he took it into his head to tie up his yard with a piece of packthread. The night, on which this experiment was made, he succeeded in hindering the calamity which he so much feared; but he awoke in great pain, both from the tightness of the ligature, and from excessive desire to make water. He now found, that he could not untie the packthread, for the double knot which had been made, as well as the circle of the string, was quite concealed by the swelled integuments, but he was afraid of complaining. His state, however, was at length betrayed by the increase of his sufferings. The family surgeon was sent for, who was obliged to cut the packthread with a bistoury, which could not be done without dividing the skin itself pretty deeply.

The child was at first unable to expel his urine: more than a quarter of an hour elapsed before he could do so, and then not before a catheter had been passed to dilate the constricted part of the canal; nor did the pain in the penis undergo any diminution until the bladder had been emptied. Applications for the prevention of mortification were now employed; but, notwithstanding their prompt use, gangrene took place in the situation of the ligature, and several sloughs afterwards separated. The prepuce and glans remained adherent to each other.

Some children are born with the opening of the prepuce so narrow, that the urine cannot be discharged without difficulty; and there are others, whose prepuce has no aperture at all; consequently, they cannot make water. Petit met with the latter sort of phimosis only twice; but the other case is frequent.

When the prepuce has no opening, the nurses and attendants are soon apprised of it by the linen continuing dry; by the infant being in pain and crying a great deal; and by the urine accumulating in the cavity of the prepuce, and occasioning so considerable a swelling, that the penis and scrotum are entirely hidden by it. The tumour is round, smooth, white, and elastic, like a hydrocele, which is very full and tense. As it is somewhat narrower towards the pubes, one might suppose, that it has a pedicle, but this smaller part of it is the penis, the integuments of which have yielded, and contributed to the enlargement of the swelling, in proportion as the urine has escaped from the urethra.

"If," says Petit, "I was surprised to see this tumour for the first time, the women, who had charge of the infant, were still more so: only two hours had passed since they had washed, cleaned, and bound it up in its swaddling clothes, and far from imagining the parts ill-formed, they had been pronouncing a very favourable opinion upon them."* When the circumstance had been related to Petit, he knew the case immediately, and, dispelling the alarm of the attendants, he gave the child instantaneous relief by an operation, which will be presently noticed.

The other child, on whom Petit did a similar operation, was not quite so lucky. As soon as it had been baptized, it was conveyed into the country; there was no time for ascertaining the nature of its complaint; and the nurse, who had not seen it before the journey, was compelled directly on her arrival home to undress it, as it had cried the whole way. She was very much astonished to find so large a swelling in the situation which it occupied; she, to whom a perfectly formed male child had been supposed to have been confided. She made the family acquainted with the occurrence, and sent for the surgeon of the village, who was as ignorant as herself of what the case was. However, he directed fomentations with warm wine, which was doing nothing; and the infant's belly grew tense, and painful.

An aunt of the child's took Petit along with her to visit it, who saw the nature of the complaint, and by means of an operation, a pint of urine was let out. A cure was thus accomplished in so expeditious a manner, that the bye-standers were nearly as much surprised at it, as they had been at the disease itself. Indeed, Petit reached the infant only just in time to save its life; for, when he entered the room, its respiration had nearly ceased, its body was livid, and its extremities cold, and covered with a clammy sweat. The instant after the operation, its plaintive cries stopped; it began to suck, and fell asleep.

Had the urine not been let out, the child must have perished with all the symptoms of a retention of urine; in fact, it was such a retention, since the course of the urine was intercepted, with this difference, that the impediment to the exit of this fluid was neither in the bladder, nor the urethra. The prepuce being impervious, the urine could not get out; the consequence was, that it had distended the bladder, the ureters, the kidnies, and the urethra itself, before producing an expansion of the prepuce. It was this part which made the longest resistance to the impulse of the fluid; but it had at length yielded, and been gradually dilated into a sac, or cyst, which was as large as a turkey's egg.

Petit assures us, that he has seen nearly the same thing happen, though the prepuce was not entirely closed, but its aperture smaller than that of the urethra, so that the urine could not get out of it as quickly as it came out of the latter passage. In cases of this description, the quantity which is ejected is less than what issues from the urethra, a portion of which lodges between the prepuce and the glans, and forms a tumour of greater or lesser size, according to the disproportion between the size of the urethra and that of the opening of the foreskin.* In consequence of this repeated distention, if nothing be done for the patient, the prepuce becomes so elongated, thickened, and relaxed, that its very size occasions considerable disfigurement. Sometimes also, ulcerated openings are produced in it, from which, when it is compressed, the urine issues. In one such case on record, the swelling had become in a child two months and a half old, as large as a hen's egg, extending up to the symphysis of the pubes. The disease, which was not understood, was at first taken to be a cancerous tumour, that had destroyed the external parts of generation. As soon as its true nature was ascertained, the opening of the prepuce was dilated with a knife, when a large quantity of a clear gelatinous substance, with a small proportion of urine, was found lodged between the ulcerated glans and prepuce, and let out. † But the above described grievances are not the only ones; for, the irritation of the urine, and of the sebaceous matter confined under the prepuce, may not only excite inflammation and ulceration of the part, and cause a complete retention of urine under the prepuce, but adhesions between the glans and the prepuce may be produced, which may afterwards prove a serious perplexity in any requisite operation. It should also be well remembered, that the impediment caused to the discharge of the urine, by the contracted state of the prepuce, may give rise to disease of the urethra and bladder. ‡

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* "Elles en avoient fait l'éloge, et un prognostic avantageux." Traité des Maladies Chirurgicales, t. ii. p. 428.

In children it is absolutely necessary, that the opening of the prepuce should be at least equal in size to that of the urethra; and, in adults, the same opening must be such as will allow the glans readily to pass through it, even when the latter part is enlarged, as it always is when the penis is erected.

A woman brought a little boy, six years of age, to M. Petit: the opening of the child's prepuce was so small, that considerable pain was suffered in making water. As the urine did not find its way out as fast as it issued from the urethra, the cavity of the prepuce was immediately filled with it, and a large swelling was produced, even before a drop had been voided externally. When the cyst was full, the child began to be in pain, and the urine to spirt out to a great distance, though in a very small stream. Petit operated on the boy, who was cured in a few days.

Another child was brought to Petit with the same disease, attended with a collection of urinary calculi in the cavity of the prepuce. One of these, about two lines in length, and shaped like a grain of oats, had insinuated its small end into the aperture of the prepuce, and thus intercepted the course of the urine. Petit tried to extract it; but it slipped away under the foreskin, and the child was then able to make water better. In this case, the operation was also done, the calculi taken out, and the boy cured in a very short time.

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* Petit, Traité des Maladies Chir. t. ii. p. 430.

† This case was originally communicated to the Academy of Surgery at Paris, and is quoted by Chopart in his Traité des Maladies des Voies Urinaires, p. 428.

‡ See Richter's Anfangsgr. b. vi. p. 191.

In all these cases, the prepuce continues full of urine, though there may be none in the bladder: and, in order to complete the evacuation, the children are obliged to empty the prepuce by squeezing it with their hand. However, they can never get out every drop, either because, when the prepuce is compressed, a part of the urine is forced back into the urethra, or because there are calculi within the prepuce, which hinder it from being exactly compressed.*

ACCIDENTAL PHIMOSIS

Is a constriction of the prepuce, formed subsequently to birth, and it usually arises from an inflammation and thickening of the part, by which its aperture is considerably diminished, while, from the very same irritation that produces this effect, the glans penis is itself often swelled and turgid, by which the difficulty of making it pass through the constriction is naturally augmented.† It may be right to notice, however, that patients rarely become affected with an accidental phimosis, unless they have a natural disposition to the disease; and it was observed by Petit, that in such individuals as are troubled in this manner, the prepuce was naturally tight and very long.‡ When the opening of the prepuce is only just sufficient to let the glans pass through it, or when the glans cannot be made to pass through it without force, the prepuce sometimes cannot be brought forward again over the glans, and a paraphimosis is the consequence. Or, supposing the prepuce can be made to cover the glans again, the slightest inflammation, or the least swelling, will hinder the glans from being denuded, and thus a phimosis commences. But, when the opening of the prepuce is capacious, a certain degree of inflammation and swelling may prevail, without preventing the glans from being uncovered.

In general, ulcers do not produce a phimosis, except when they attack the prepuce itself, and particularly the margin of its opening. If the complaint has sometimes been brought on by chancres of the glans, it has almost always been when these sores have been situated upon the corona glandis, where the membrane of the prepuce is reflected, or else upon the frænum, which is only a duplicate of the same membrane.*

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* J. L. Petit, Traité des Maladies Chir. t. ii. pp. 421—432.

† "Ce sont les chancres et les poireaux vénériens qui rendent le phimosis compliqué, &c. Le gonflement qu'ils attirent sur le gland et sur le prépuce augmente le volume de l'un et l'etroitesse de l'autre, de sorte qu'ils se gênent réciproquement."—Sabatier, Médecine Opératoire, t. iii. p. 325. ed. 2. "Speciales morbi causæ sunt omnia, quæ glandis volumen augent, aut tumorem, vel stricturam præputii inducunt."—Callisen, Syst. Chirurgiæ Hodiernæ vol. i. p. 281. Hafniæ, 1798.

‡ T. ii. p. 433.

Phimosis is often brought on by severe gonorrhœa, and even by warts, when they are large and ulcerated. The same effect is also frequently produced by simple excoriations, which arise from the confinement and acrid quality of the sebaceous matter secreted round the corona glandis. A phimosis, with swelled testicle, has been known to originate from a blow †, though, on receiving information of such a cause, I should be very suspicious of a gonorrhœa being the original complaint. In short, both the phimosis and paraphimosis, which happen subsequently to birth, are occasioned by some species of irritation, producing a thickening of the cellular membrane of the prepuce, and sometimes also an increase in the size of the glans itself. ‡

The inflammation of the prepuce is sometimes violent, and of the erysipelatous kind; while, in other instances, the part has an anasarcous appearance, owing to the extravasation of serum.

Phimosis is not unfrequently the cause of very bad consequences, especially when it is attended with chancres behind the glans; for the latter part, being situated between the sores and the orifice of the prepuce, may hinder the pus from finding its way out. The result is, that the discharge accumulates behind the corona glandis; this peculiar kind of abscess then excites ulceration on the inside of the prepuce, and, when it bursts, the glans often protrudes through the opening, throwing the whole prepuce to the opposite side. §

Mr. Travers has correctly pointed out the evils, which may arise in certain cases of phimosis from extravasation of the urine. In some instances, the tension of the parts is relieved by the sloughing of the glans penis, and the urine, insinuating itself into the elongated prepuce, gives rise to circumscribed ulcers of the part, by which it is discharged. In other examples, where the mouth of the prepuce is closed by adhesion, and a retention of urine ensues, ulceration, both of the prepuce and urethra, takes place, the urine is extravasated in the cellular membrane, and the body of the penis is sometimes denuded by gangrene even to the pubes. A state of phimosis is also described, where the swelling is excessive, so as to compress and partially stricture the urethra, and which, if unrelieved, tends to ulceration of that canal, extravasation of urine, and gangrene. ||

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* Petit, Traité des Maladies Chirurgicales, t. ii. p. 434.

† Travers, in Surgical Essays, part i. p. 135.

‡ In children who have calculi in the bladder, the sympathetic irritation experienced at the glans penis, frequently makes them pull their prepuce, by which means it is very much lengthened, and disposed to phimosis.

§ Hunter's Treatise on the Venereal Disease, p. 223. edit. 2.

|| Surgical Essays, part i. pp. 136—137.

In numerous books, we find it stated, that both phimosis and paraphimosis are commonly owing to the venereal disease. From the preceding account, however, it is sufficiently clear, that any cause, occasioning an inflammation and swelling of the prepuce, and a consequent diminution of its aperture, whether attended with an increase in the size of the glans, or not, may give rise either to a phimosis, or paraphimosis; and that, of whatever nature the cause may be, the effect itself is always quite free from syphilitic infection. In a word, it is a simple, inflammatory thickening of the prepuce, producing a diminution in the capacity of its orifice, so that when such orifice is in front of the glans, this part cannot be uncovered, and when behind, it cannot be covered again, and a more or less dangerous constriction is made round the penis by the contracted part of the foreskin.

OF THE TREATMENT OF THE NATURAL, OR CONGENITAL PHIMOSIS.

It is an established maxim in surgery, that, in these cases, no operation should be practised upon children, unless great inconvenience from the impediment to the discharge of the urine be suffered; for experience fully proves, that the constriction generally undergoes a natural removal as the patient approaches the adult age. The causes of this change I have already touched upon in the preceding part of this chapter, and, in addition to what has there been stated, it is to be recollected, that as, at this period, the organs of generation are undergoing considerable developement, the prepuce will the more readily accommodate itself to the size of the glans.

When, however, the prepuce is either imperforate, or so contracted in an infant, that the urine cannot be voided at all, or not without more or less pain, difficulty, and distention of the foreskin into a considerable cyst, the sooner an operation is performed the better. In the first case, indeed, the practice is immediately necessary for the preservation of life. Also, if the constriction of the prepuce does not disappear at the approach of manhood, but continues to be a serious obstacle to the additional function for which the organ is then designed, the surgeon should not hesitate to recommend an operation.

When the tightness of the prepuce is not very great, trials have occasionally been made to effect its dilatation with mechanical contrivances: and Trew, a practitioner at Nuremberg, invented an instrument with branches, which could be expanded in the degree required, and which were calculated for holding the part in a dilated state.* Lassus used this instrument with success on a young man who was about to be married, but could not be prevailed upon to bear an incision: it was unremittingly worn about three weeks, at the end of which time the constriction was obviated.* The plan, however, has generally been found much more painful than the use of the knife, and, being tedious and uncertain, has little or nothing to recommend it.

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* Acta Physico-Medica Acad. Naturæ Curios. t. ii. obs. 48. p. 110. The instrument is represented in Heister's 26th Plate, fig. 5. vol. ii.

There are two methods of operating for the cure of phimosis; in one, the surgeon amputates the whole of the constricted portion of the prepuce by the performance of circumcision; in the other, he opens the prepuce by a simple longitudinal incision. In the generality of cases, the first practice is much better than the second, which always leaves two flaps, which are not only a disfigurement, but a real inconvenience, and sometimes an obstacle in coition. Indeed, the deformity of the prepuce, occasioned by this plan of operating, and the annoying friction, to which the angles of the part are continually exposed, have been such as to make some patients desirous of having the prepuce united again. One patient, who was thus incommoded, was advised by Fabricius ab Aquapendente to submit to an operation resembling that for a harelip†; but the author does not state whether it was actually performed. Bertrandi, however, was acquainted with a surgeon at Paris, who endeavoured to reunite the parts by means of the twisted suture, but could not succeed.‡ Such indeed are the unpleasant effects which often follow the operation of slitting open the prepuce, that the method is sometimes modified by combining with it the removal of the two flaps, or angles of the skin. The latter plan, however, can only be regarded as a less simple, and more imperfect and painful kind of circumcision. It is, in fact, a double operation. But I would not wish to be understood to say, that the amputation of the two angles is not necessary, nor advantageous, if the operation of slitting open the prepuce be adopted. On the contrary, I am inclined to think, that, under these circumstances, it is right, especially if the prepuce be very long, as well as contracted.

As Richter observes, we may the more readily decide to give the preference to circumcision, because, in many patients, the prepuce is of extraordinary length from having been repeatedly distended with urine, and, after the operation, so considerable a portion of it still remains, that one can scarcely perceive that any of it has been cut off. Frequently, the surgeon may remove half an inch or more of the foreskin, without the part being afterwards at all too short.§

In all common cases of natural phimosis, the best modern operators in this metropolis, and many excellent surgeons abroad*, prefer circumcision. The prepuce is taken hold of with a pair of forceps, and as much of the part being left out as seems necessary to be removed, the surgeon cuts a complete circle of the prepuce off by one stroke of the knife, guided along the forceps as a pencil is along a ruler, and if the inner membrane of the prepuce should appear still to be too tight, it must be divided with a curved knife. The external skin of the part is then usually prevented from becoming separated from the inner layer by a fine suture, introduced through both their edges, and simple dressings are applied. In the cases which have fallen under my observation, it has seldom been necessary to tie any vessel. Bertrandi cut off the whole prepuce in three instances, but without any bleeding of importance.† A small linen cap, made to fit the part, will be found very convenient for keeping on the dressings; it is to be pinned to a bandage applied round the waist, and taken off when the patient has occasion to make water.

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* Pathologie Chir. t. ii. p. 478. 8vo. Paris, 1809.

† De Chirurg. Operationibus, cap. 61.

‡ "Un chirurgien de mes amis, à Paris, ayant fait en pareil cas cette suture, eut le déplaisir, et le malade la douleur, d'en voir les points déchirés par un priapisme malencontreux." Traité des Opérations de Chirurg. p. 238.

§ Loder, Chir.-Med. Beobachtungen, p. 86.

In applying the forceps, it should be recollected, that the upper part of the prepuce is quite unconnected to the glans, and longer than the lower part, which is also connected with the frænum; hence, the surgeon always finds it necessary to leave more of the upper portion of the prepuce out of the forceps to be cut off with the knife, than of that part of it which joins the frænum. Particular care should invariably be taken, however, to leave out for removal all such portion of the prepuce as is too tight, preternaturally thickened, redundant, or diseased; for, if this object be not properly fulfilled, the inflammation subsequent to the operation will be liable to bring on a greater constriction, or even an entire closure of the prepuce, urgently requiring a second operation, which now must unavoidably be that of slitting open the part.‡

It is not a great many years since the general practice was to slit open the prepuce with a narrow, sharp-pointed, curved bistoury; and it was in this way that Petit operated, in the cases to which I have requested the reader's attention in a foregoing part of this chapter. The anterior part of the prepuce is first to be taken hold of with the left thumb and fore-finger, by which means it will be rendered tense, the requisite instruments be more conveniently introduced, and the part more easily divided. When the opening in the prepuce is very small, a probe must be introduced, and, with the aid of this, a grooved director: the probe is then to be withdrawn, the knife passed along the director as far as the corona glandis, and its point being pushed from within outwards, all such portion of the prepuce is to be divided by one stroke, as is within the grasp of the instrument.

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* Richter, Anfangsgr. b. 6. p. 192. Loder, Chir. Beobachtungen, b. i. p. 86.

† Traité des Opérations de Chirurgie, p. 243. In a few instances, however, the hemorrhage proves troublesome; it may happen two or three days after the operation; and when it resists the usual means, constant pressure kept up with the finger will stop it. Loder, lib. cit. pp. 86—88.

‡ See Richter's Anfangsgr. b. vi. p. 193.

With respect to the best place for the longitudinal incision of the prepuce, some diversity of opinion prevails amongst surgical writers. Some recommend the upper part of the prepuce; others prefer one side of it.* It was the fear of hemorrhage which mostly led surgeons to adopt the latter mode. But, as I happened to serve an apprenticeship to an hospital-surgeon, who was exceedingly partial to the method of slitting open the prepuce at its upper part, I can affirm with Petit, that the hemorrhage may always be stopped by proper management, and that it is not this consideration by which the situation of the incision ought to be determined.† The true reasons, by which a decision should be formed, are the advantages, which are to be derived from one method, or the other. If a longitudinal division of the prepuce is to be made, it is clear, that it is more advantageous to let the incision be at the upper part of the prepuce, opposite the middle of the glans, than on one side. First, because the two flaps being equal, the glans can be more readily uncovered, than when one flap is small and the other large. Secondly, because making one or two lateral incisions occasions greater deformity, and is prejudicial to the functions of the part. Petit was consulted by several persons, who had had their prepuces slit open on one side, or both sides; and the annoyance, which they suffered, made it requisite for them to submit to the following treatment: —

When the prepuce had been slit open on both sides, the intervening flap was removed with a stroke of the knife; but when only one lateral cut had been practised, Petit introduced a bistoury under the flap, and divided it longitudinally at a point corresponding to the situation of the former incision on the opposite side; the operation was then finished, by detaching the piece of the prepuce, between the two cuts, altogether from the penis.‡

OF THE METHOD OF OPERATING, WHEN A PHIMOSIS IS COMPLICATED WITH ADHESION OF THE PREPUCE TO THE GLANS.

Although this case is more frequently the consequence of an accidental phimosis, which has been attended with inflammation, excoriations, and ulceration, than the congenital form of the disease, experience proves, that it may follow either case, when the parts are subjected to any causes capable of producing inflammation of the prepuce and glans. This complication of phimosis particularly deserves the attention of the practical surgeon, because it is an example, which, when an attempt at cure is deemed advisable, and the adhesions are extensive, or particularly situated, may compel him to deviate from the good general rule of giving a preference to circumcision. Or if that be inadmissible, the state of the disease may oblige him to abandon the approved maxim, of always making the longitudinal cut in the prepuce exactly in the centre of its upper part.

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* "It is much safer to make the wound on one side of the prepuce than upon the upper part; for, I have sometimes seen the great vessels on the dorsum penis afford a terrible hemorrhage." Sharp's Treatise of the Operations, chap. ii.

† Vol. cit. p. 440. I am far, however, from meaning to question the accuracy of Mr. Sharp's statement, that very troublesome bleedings may ensue. On the contrary, I have seen them happen; but they were invariably stopped by pressure, and cold applications. In whatever way the phimosis is cut, the hemorrhage will sometimes be profuse, and break out again from time to time, for some days after the operation. We see from Loder's experience, that the hemorrhage after circumcision may be troublesome, but that it can always be stopped by pressure with the finger. See his Chir.-Med. Beobacht. p. 85.

‡ Petit, Traité des Mal. Chir. t. ii. p. 441.

Petit had occasion to operate in two cases, attended with a good deal of difference. In one, the phimosis was not adherent to the whole surface of the glans, and a probe could be introduced between it and the prepuce, but all the anterior part of the prepuce being adherent to the glans, a probe could be passed in only at the side. Here Petit was obliged to divide the prepuce with a bistoury and director. The small flap was not adherent, but the large one was universally so, and it was necessary to detach it, by drawing it in one direction, and the glans in the other, which could not be done without considerable pain. The separation was accomplished partly by tearing the adhesions, and partly by cutting them. After the glans had been cleared as far as the corona glandis, the large flap was diminished, by removing part of it in the manner above related.

In the other case, neither a director nor a probe could be introduced, and the disease gave a vast deal of trouble and pain. Petit made an assistant pinch up the skin of the prepuce on one side, while he did the same thing himself on the other side. He then made a longitudinal incision in the middle, through the prepuce down close to the glans, which, however, he avoided injuring. In order to discern the membrane of the glans better, the angles of the wound were now drawn in opposite directions, and, by patient and careful dissection, Petit succeeded in detaching the prepuce from the glans, without hurting the latter. The operation is acknowledged, however, to have been extremely painful, as the prepuce could not be separated from its connexions without forcibly pulling it, and the proceeding is compared to the skinning of an eel.

Though Petit may be adduced as an authority for attempting to separate the prepuce from the glans, when the adhesions are so firm and extensive, that no instrument can be introduced, yet, we find, that he could not do what he did, without the utmost difficulty to himself, and pain to his patient. Hence, it may generally be as well not to be anxious to undertake an operation in these circumstances, and, except the patient be very urgent himself, it may be prudent at most only to make such an incision, as will suffice for removing any impediment to the exit of the urine. Richerand positively assures us, that experience has convinced him, that the operation for the relief of phimosis, in individuals past the age of puberty, is always ineffectual, when adhesions exist between the glans and prepuce.*

OF THE TREATMENT OF ACCIDENTAL PHIMOSIS.

From the extensive sloughing, which I have frequently seen follow operations performed on the prepuce, during its inflamed and œdematous state, in cases of phimosis, I have no hesitation in asserting, that such practice is generally very injudicious. If we exclude the particular instance, in which purulent matter accumulates under the prepuce, and cannot make its exit, except by an ulcerative process, an inflamed phimosis can rarely, or never, require the employment of the knife.

The cases, which require an operation, are such as are natural, and do not amend as the patient becomes an adult; such as occur without acute inflammation, and, according to all appearance, spontaneously; and others, which arise from the puckering of the prepuce, in consequence of former ulcerations.

The inflammation of the prepuce, occasioning an accidental phimosis, may depend upon various causes; for instance, simple excoriations, or superficial ulcerations produced by the confinement and irritating quality of the secretion from the sebaceous glands; the same effects, resulting from commerce with women affected with fluor albus: the inflammation and swelling of the prepuce and glans may also originate from a severe gonorrhœa; from the irritation of chancres, or other ulcers, especially those which are situated upon the inside of the prepuce, upon the frænum, or behind the corona glandis. The pressure and irritation of large warts, growing from the glans, are likewise another occasional cause of a phimosis, attended with inflammation.

All these examples, if neglected, or badly treated, may bring on extensive ulceration, and even mortification.

With respect to the treatment of the phimosis from simple excoriation, and the irritation of the natural secretions lodged under the prepuce, the principal indications are, to wash away the acrid matter by injecting tepid water, or the diluted liquor plumbi acetatis, and to have recourse to common antiphlogistic means; cold applications to the inflamed prepuce; or the immersion of the penis several times a day in warm water; rest; saline purgatives; low diet; and, if necessary, leeches and venesection. In all severe cases of phimosis with inflammation, great benefit may also be derived from supporting the part at an angle upwards from the symphysis of the pubes.†

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* Nosographie Chirurgicale, t. iv. p. 529. edit. 4.

† See Richter's Anfangsgr. b. vi. p. 200., Götting. 1802.; and Travers in Surgical Essays, part i. p. 188.

The phimosis, originating from virulent gonorrhœa, chancres, or other sores, may require, in addition to local and general bleeding, warm emollient poultices, containing laudanum. Great relief will frequently be produced by the application of the steam of hot water, or of vinegar and spirit of wine, to the inflamed prepuce. But nothing is more essential, than repeatedly injecting tepid water under the foreskin, for the purpose of cleansing the sores, and washing away their discharge, or the matter which issues from the urethra; and, when the fluid is thrown out of the syringe, the orifice of the prepuce should always be gently compressed, so as to let the injection pass freely about between the glans and prepuce, before it is discharged.

In cases of chancres, Richter recommends a lotion, which is composed of twelve grains of opium, three grains of the submuriate of mercury, and six ounces of water. This is both to be injected under the prepuce, and applied to its outside, by means of linen kept constantly wet with it.

In cases of gonorrhœa and chancre, a phimosis may often be foreseen and averted, by directing the patient to draw back the prepuce frequently, to wash and bathe the parts, keep himself quiet in a horizontal posture, and the penis directed upwards.

When a chancre is complicated with an inflamed phimosis, experience proves, that it is a most unnecessary and pernicious practice, to continue the exhibition of mercury, before the inflammation and swelling of the prepuce have abated. A modern surgeon, indeed, lays it down as a general rule, that the constitutional administration of this mineral is always inadmissible, during the existence of active inflammation in cellular textures.* The truth of this observation, as far as the inflamed prepuce in cases of chancre is concerned, I have had many opportunities of ascertaining, and, I believe, that, next to the rash employment of the knife, nothing has a greater tendency to make the sore spread and slough. Besides, in deferring the exhibition of mercury under these circumstances, we need not be frightened with the idea, that the sores must continue to get larger, and that the constitution will become more and more infected; for, recent investigations into the nature of syphilis, fully prove its general curability without any mercury at all, and that, contrary to opinions once not unfrequently promulgated, it is not the character of this disease invariably to get worse and worse, and to proceed from one order of parts to another, with increasing malignity, though no mercury, and no particular medicines be administered.†

When the discharge from chancres or other sores is completely confined under the prepuce, Hunter sanctions the method of making a puncture into this peculiar kind of abscess with a lancet, and through this opening, suitable lotions may be injected. If no puncture be made, an aperture will be formed by ulceration, and through such opening the glans is liable to protrude, so as to throw the whole of the prepuce to the opposite side, and occasion serious deformity, as I have already explained. Should this change have already taken place, the best plan is to divide the portion of the prepuce intervening between the natural and the ulcerated opening.

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* Travers, Surgical Essays, part i. p.151.

† See the first part of this volume, and Mr. Rose's paper in Medico-Chir. Trans. vol. viii.

When the inflammation, swelling, and constriction of the prepuce diminish, and the sores begin to heal, the glans should now and then be uncovered, in order to prevent the formation of adhesions. If this precaution be neglected, the prepuce will sometimes become adherent at various points to the glans, and its orifice close so much, that the urine can hardly be discharged. In such a case, when the opening of the prepuce lies opposite that of the glans, Richter recommends us to introduce a bougie for the purpose of dilating it; but when it is situated laterally, more or less away from the orifice of the urethra, he considers the employment of the knife indispensable, though the difficulty with which the adherent parts are separable, is at the same time frankly acknowledged.*

It is particularly in cases where an obstruction to the urine arises from the effects of the inflammation and swelling upon the extremity of the urethra, that a proposal has been made to have recourse to a small elastic catheter, with a view of preventing ulceration of that passage. With this treatment are to be conjoined fomentations and emollient poultices. †

In phimosis with inflammation, the operation of dividing or amputating the prepuce, may be set down as unnecessary, as long as the patient can void his urine, the matter find its way out, and the requisite injections be applied under the prepuce. How many times has it been my lot to see the prepuce slit open, for the sole purpose of examining and dressing sores under it! How many times have I seen this erroneous practice followed by a rapid extension of the ulcers, sloughing, and loss of the whole, or a considerable portion of the penis! Sores under the prepuce seldom essentially require any particular dressings, the very presence of which, in this situation, frequently produces all the irritation of a foreign body; and, if the ulcers be kept clean, by the frequent injection of tepid water, and the inflammation of the parts be appeased by proper antiphlogistic means, the treatment is complete, as far as local measures are concerned.

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* Anfangsgr. b. vi. p. 200.

† Travers, Surgical Essays, p. 137, 138.

CHAP. XLVII.

OF PARAPHIMOSIS.

By the term, *paraphimosis*, surgeons generally understand that particular case, in which the prepuce is drawn behind the glans penis, where the narrowest part of it produces such a degree of constriction round the penis, as occasions, not only more or less difficulty in reducing the glans, but considerable pain, inflammation, and swelling, sometimes terminating, when the complaint remains for a certain time unrelieved, in the destruction of the latter part, and also of the skin, including the prepuce, by a rapid species of gangrene.

Besides this form of paraphimosis, which is far the most interesting to the practical surgeon, writers comprehend under the same name other examples, in which the glans penis cannot be covered, merely because the prepuce is either too short, or altogether wanting. These cases are essentially different from the former, inasmuch as they are never attended with any constriction behind the corona glandis, nor of course with any urgent symptoms. This extraordinary shortness, or total deficiency, of the prepuce, is sometimes *congenital*, sometimes *accidental*, or the result of a more or less considerable loss of the part from circumcision, ulceration, or sloughing. When an individual is born with this kind of paraphimosis, it cannot be remedied by any applications, or operation; a fact, now completely established, notwithstanding it may not tally with the opinions of some of the ancient surgeons.*

PARAPHIMOSIS ATTENDED WITH CONSTRICTION

Frequently follows phimosis, in consequence of the thickened and contracted prepuce being drawn back quite behind the glans, and not being immediately restored to its former situation again; or it may be induced by a naturally tight prepuce being forced behind the glans in coition, &c. In these circumstances, the constricted part of the prepuce acts as a tight ligature round the body of the penis, and seriously obstructs the return of blood from the glans, and from the portion of the prepuce which is beyond the stricture. Hence, the latter part is attacked with a considerable degree of œdematous inflammation, while the glans itself becomes greatly inflamed, its distention hourly increasing, and if speedy relief be not afforded, the parts are at length threatened with gangrene. When mortification takes place, however, it is generally the glans alone which is destroyed, and the dead part separates without further mischief; the sloughing not easily extending to the corpora cavernosa. In some instances, the prepuce sloughs, including that part of it which is directly concerned in producing the strangulation, and thus the cause of all the suffering, and inflammation, is removed by a natural process.

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* "Si glans nuda est, vultque aliquis eam decoris causa tegere, fieri potest." Cornel. Celsus, lib. vii. cap. 25. Paulus Ægineta, lib. vi. chap. 53.

A simple paraphimosis, arising merely from the retraction of a tight prepuce, and not from a venereal cause, is not attended with so much risk of mortification of the glans, as is generally supposed. Loder furnishes us with an example, where the operation was not performed before the glans had been strangulated eleven days, and yet it had not sloughed.*

Both the phimosis and paraphimosis occasionally arise from circumstances wholly unconnected with sexual intercourse, and, in proof of this statement, Mr. Travers quotes a remark from Mr. Latta. "Young boys frequently bring on a paraphimosis by retracting the prepuce in diversion, until they become unable to pull it forward again. As they conceal this for some time through fear, it is not uncommon for the parts to become inflamed and swelled to a great degree, and I have even found gangrene taking place, before the matter was found out." †

In cases of paraphimosis, the disease rarely ends in sloughing, unless the treatment has been injudiciously conducted, or the patient has long neglected to apply for surgical assistance. In general, also, the pain of the complaint, and the obvious inconvenience and deformity of a permanently exposed glans, and enormously enlarged prepuce, bring the disorder sooner than a phimosis to notice, while it is so easily reduced by the aid of timely scarifications of the swollen prepuce, fomentations, and compression of the glans, that it is rarely suffered to remain unrelieved. ‡

In the treatment, the principal indication is to remove the stricture behind the glans as quickly as possible. Upon this point all surgeons may be said to be unanimous; but, with respect to the best and safest mode of accomplishing this desirable object, a difference of opinion prevails; some practitioners being advocates for the early use of the knife for the division of the stricture; others, sanctioning this practice only when other means fail.

Frequently the disease may be at once relieved, by compressing as much of the blood as possible out of the glans penis, and then pushing the part back again through the stricture. In order to perform this operation adroitly, the surgeon should first make continued pressure on the glans, by placing it between the ends of the thumb, index, and middle fingers, of each hand. The whole surface of the part should thus be gradually compressed, at the same time, for the space of four or five minutes. Then, the two thumbs are to be employed in pushing backward the diminished glans, and the fingers, in drawing forward the prepuce.

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* Chir.-Med. Beobachtungen, p. 90. 8vo. Weimar, 1794.

† Latta's Surgery, vol. i. p. 391.

‡ Travers, Surgical Essays, part 1. p. 154.

The success of the preceding method is materially promoted by immersing the penis, for some time before the attempt at reduction is made, in ice-cold water, until its size, and more especially that of the glans, are considerably lessened. In confirmation of the excellent effects of cold applications in facilitating the reduction of the glans in an early stage of the disease, we have the testimony of Callisen*, who assures us, that, with respect to emollients, unless they quickly afford relief, they do harm. It is very common, however, to see practitioners of eminence and talent prefer in these cases warm applications to cold; and fomentations, scarifications of the swelled prepuce, or leeches applied near it, venesection, compression of the enlarged glans, and other common antiphlogistic measures, may be said to form the outline of the ordinary treatment of paraphimosis; nor can it be doubted, that the plan is generally successful. At the same time, I believe, that at least an equal degree of success would be experienced, if ice-cold water were substituted for the fomentations.

Richter is very partial to the early use of the knife, as the surest and most expeditious mode of relieving paraphimosis after the disease has attained a certain degree. In doing this operation, the surgeon is to remember, that the narrow opening of the prepuce usually lies, like a tight cord, in a depression extending round the penis, while the glans, and the portion of prepuce which is situated between the glans and the constriction, is placed behind the latter part, in the form of a thick swollen mass of flesh, so that it is frequently quite impossible to introduce any knife under the stricture, for the purpose of cutting it from within outwards.

The best way of performing the operation is to lift up the skin of the penis into a fold, close behind the stricture, where it is always loose and moveable, and then to cut through the part which is raised. A small blunt-pointed director is next to be introduced through the wound into the cellular substance, and carried forwards under the constriction, until its extremity can be plainly felt on the side towards the end of the penis, when the surgeon is to cut into the groove of the instrument, and thus divide the stricture. After the constriction has thus been obviated, the prepuce cannot always be immediately brought forwards over the glans, and, perhaps, in cases where the operation has been absolutely necessary, it is never at once practicable. Here, as Richter observes, the prepuce is usually so inflamed, indurated, thrown into adherent folds, fixed, and enlarged from the effects of the constriction, that every endeavour immediately to cover the glans with it must be fruitless. The attempt is also unnecessary: it is quite enough that the constriction has been removed; and the surgeon need not be in a hurry to cover the glans. From the moment that the operation is finished, the symptoms begin to subside; and, as soon as the inflammation and swelling have entirely disappeared, the prepuce falls of itself over the glans.*

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* Syst. Chirurgiæ Hodiernæ, vol. i. p. 285. Hafniæ, 1798.

CHAP. XLVIII.

AMPUTATION OF THE PENIS.

It is very generally set down, in surgical books, that cancer and mortification †, of the penis, are the two cases for which this operation is required. That the first disease is frequently a proper reason for amputating the penis, is unquestionable; but, that mortification is so, every reflecting surgeon will deny. The mortified part will separate, and the living surface cicatrize afterwards, fully as well, as if the patient were to submit to a painful operation.

I am glad to have it in my power to adduce, in support of the foregoing remark, the sentiments of the experienced and judicious Loder, who unequivocally declares, that, in examples of mortification, he would never undertake the operation. When the gangrenous mischief, says he, is spreading, amputation will be of no use, because it will not stop the disorder; but if the mortification has ceased to extend itself, the operation will be superfluous, as nature herself will throw off the dead parts. ‡

When the case is a scirrhous, or cancerous disease, the prospect of a perfect cure will greatly depend upon the testicles, skin about the pubes, and glands in the groin, being free from induration. I have now seen this operation performed three times, and, in the first instance, the disease had extended to the testicles and inguinal glands, so that though the patient got rid of the disease, situated on the penis, the disorder continued to increase in the groin and scrotum, until life was exhausted.

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* See Richter's Anfangsgr. b.vi. p. 206. "The œdematous swelling of the prepuce, (says Loder,) sometimes prevents for a couple of days, this part from being put over the glans, though the stricture has been completely removed by the operation. By the continued use of the diluted liquor plumbi acetatis, this swelling may be got rid of; but, should it last longer, a scarification or two with a lancet will be requisite." Chir.-Med. Beobachtungen, p. 87.

† In mortification from paraphimosis, or other causes, the operation is recommended both by Heister, (Institut. Chir. 816.) and B. Bell, (Syst. of Surgery, vol. i. p. 538.) Richter deems the operation unnecessary for the separation of the sloughs; but thinks the knife may sometimes be requisite for making the end of the stump equal, when it has healed with inequalities. However, beauty seems to me a subject here not worth considering, at least, in a surgical point of view.

‡ Chir.-Med. Beobachtungen, p. 79.

As the serious mistake has sometimes happened, of amputating the penis for a disease, which, on further examination, appeared to be of a very simple and curable nature, surgeons cannot be too cautious in the investigation of the circumstances of the complaint for which the operation is proposed. In particular, they must carefully distinguish the cancerous disease of the penis from the more common warty excrescence. "I have seen, (says Mr. C. Bell), a man just about to lose his penis, on account of a combination of phimosis with these warty excrescences from the glans, and which had burst through the prepuce with a very malignant-like distortion. But the prepuce being freely cut open, the luxuriant crop of harmless warty excrescences started forth." *

It is certainly true also, that the penis has been cut off, when the prepuce was the only diseased part. What are commonly (but as I conceive incorrectly) termed *venereal* warts, are well described by the latter writer: they have a spreading, mushroom-like top, and slender base; and if the intermediate parts can be seen, they retain their natural appearance. A tubercle, formed on some part of the prepuce, is often the beginning of cancer of the penis: it is at first, as Mr. C. Bell remarks, an irregular warty excrescence, with a broad base in the substance of the prepuce, or on the frænum. In a more advanced and ulcerated stage, the sore is of a dark red colour, covered with a sanious discharge; its bottom is solid, and deep excavations, and irregular cauliflower excrescences, present themselves. The neighbouring skin, of a purple colour, indurated, swelled, and tuberculated, stands out from the sore, while its irregular edge is turned inwards. The discharge has a peculiar smell, being highly offensive, and when the urethra is ulcerated, the urine gushes out from preternatural openings. †

Cancer may also commence upon the glans, as happened in the very first case, in which I had an opportunity of seeing an amputation of the penis done. The disease here also usually begins in the form of a wart, or small, not very troublesome, induration, which gradually changes into a most painful ulcerated excrescence. Sometimes, as Richter informs us, the greater part of the penis is covered with such excrescences, the cancerous nature of which is particularly indicated by the deep extension of their bases into the substance of the parts from which they grow, the parts appearing for some depth to be converted into a similar hardened mass to themselves. I have seen the whole glans, and part of the corpora cavernosa ‡, changed, in this manner, into a firm incompressible substance, which had been gradually extending itself for years, the glands in the groin being also diseased in the same way.

Sometimes, after the prepuce has been slit open for the relief of a congenital phimosis, a large irregular fungus sprouts out from the extremity of the penis, and continues spreading until it has occupied all that part of the organ, which naturally projects beyond the scrotum. Frequently, in these circumstances, neither the prepuce, nor the glans can be distinctly perceived; but the whole projecting part of the penis forms a confused mass of irregular granulated flesh, discharging a very fœtid matter.* It would appear, from several of the cases recorded by Mr. Hey, that tubercles, or excrescences, actually existed within the prepuce before the operation, and were found there as soon as the phimosis was cut.† What is likewise remarkable, is the great frequency, with which the cancerous disease of the penis seems to be attended with, or preceded by, a congenital phimosis. Mr. Hey found this to be the case in seven out of nine examples which fell under his notice, and (says he) "where I had an opportunity of seeing the disease in an early stage, the phimosis evidently appeared to have been caused by an unnatural formation of the internal membrane of the prepuce; and this formation seemed also to have given rise to the cancerous affection." The facts, brought forward by this gentleman, tend to prove, that this malignant affection mostly commences upon the prepuce, and that, in its earliest stage, the whole lining of that part is studded with minute tubercles, or inequalities, which change into the worst kind of disease.

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* Operative Surgery, vol. i. p. 130. 8vo. Lond. 1807.

† Op. cit. vol. i. p. 131.

‡ See Case in Hey's Practical Obs. in Surgery, p. 465. edit. 2.

According to Mr. Travers, a malignant ulceration of the prepuce and penis, following phimosis, and requiring amputation, may be brought on by an indiscreet perseverance in the use of mercury during the period of inflammation.‡

Whenever excrescences on the penis have a narrow base, they may be cured by cutting them off, and the amputation of that organ is totally unnecessary, and of course improper.§ This I consider more judicious treatment, than applying to them a solution of the oxymuriate of mercury and opium for their cure, under the idea of their being venereal. Also, when the wart or excrescence is of a malignant kind, but limited to the prepuce, a cure may generally be effected by a removal of the part, without touching the glans or body of the penis itself.|| Lastly, it is to be recollected, that diseases of this organ, which had put on a most malignant appearance, have been sometimes cured by the carrot-poultice ¶, and the internal and external use of arsenic.

In the operation, the plan of saving as much of the penis, and also of the glans, as circumstances will allow, with due regard to the entire removal of every particle of the disease, is undoubtedly entitled to commendation; because the longer the stump is left, not only the more conveniently will the urine afterwards be dis-

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* See Case in Hey's Practical Obs. in Surgery, p. 461. edit. 2.

† See Cases, pp. 463. 473, &c.

‡ Surgical Essays, part i. p. 152.

§ Richter, Anfangsgr. b. vi. p. 183. Göttingen, 1802.

|| See Case in Hey's Practical Obs. p. 473. edit. 2.

¶ Gibson, in Med. Obs. and Enquiries, vol. iv.

charged, but even the faculty of generation be more likely to be preserved. In confirmation of the latter point, the testimony of Heister might be adduced, and Loder mentions one example, in which the patient retained the power of propagating after amputation of the whole of the glans.*

Amputation of a cancerous affection of the penis often effects a cure, relapses being much less frequent, than after the generality of operations for the removal of cancerous parts. In the three first cases published by Mr. Hey, the cure after the operation was permanent.† In order to ensure this success, however, it is essential not to defer the use of the knife until the disease is no longer local, and the whole of it cannot be taken away. Hence, before determining to operate, it is a rule with surgeons carefully to examine whether the disease has extended to other parts, especially the glands in the groin. When they are indurated and enlarged, many good practitioners decline the operation altogether, the event of which is then always to be regarded as doubtful. Thus, in one instance, in which the glands of the groin were much tumefied, Mr. Hey ventured upon the operation, because the swelling of the glands did not exist before escharotics had been applied to the disease of the penis, and consequently it was dubious whether their enlargement was truly cancerous or not; but the patient died from a relapse. The inguinal glands lessened for a time, but afterwards increased considerably: there was, however, never any fresh ulceration.‡ Sometimes the only part affected, in addition to the penis, will be the integuments covering the ossa pubis, in which situation a hard tumour is perceptible. In one case of this description, operated upon by Mr. Hey, a permanent cure ensued, care having been taken to cut out the swelling at the pubes: the wound here remained for some time foul; but, on applying to it red precipitate and burnt alum, it assumed a better appearance, and afterwards healed.§ When the cancerous disease does not extend beyond the glans, immediately behind which the incision can be safely executed, there is no objection to the method of cutting through the whole of the penis, with one stroke of the knife. However, in order to cover the ends of the corpora cavernosa with integuments, the plan is sometimes followed of first drawing them towards the pubes, before the incision is made, or else of merely making at first a circular cut through the skin, which is next pushed a little way up towards the pubes, and the rest of the penis divided in a line with the edge of the retracted skin. This last way of operating, however, is not approved of by the generality of modern surgeons; for it is slower, and more painful, than a direct incision through the whole organ; it does not shorten the cure, and is liable to inconveniences. If, indeed, the preservation of skin for covering the end of the stump were any real advantage, the surgeon would always have enough for this purpose by cutting straight through the part, because the corpora cavernosa constantly shrink towards the pubes as soon as they are cut through, and leave the integuments projecting. But the truth is, no benefit is derived from the redundance of skin: in one case, Mr. Hey made an attempt to heal the wound by the first intention, and, with that view, brought the integuments over the divided corpora cavernosa, and, that he might make the integuments lie over the end of the penis without puckering, or covering the orifice of the urethra, he made a longitudinal division of them at the inferior part of the penis, and introduced a small silver cannula into the urethra. "I was disappointed," says he, "in my design of healing by the first intention; for the integuments would not adhere to the extremity of the corpora cavernosa. These spongy bodies, when divided, do not readily throw out granulations; but have usually for some time an ill-conditioned appearance." * An objection to amputation of the penis by the double incision, is, that the superfluous flap of skin, further augmented by the natural retraction of the divided corpora cavernosa, renders it more difficult to secure the blood-vessels, which become concealed under it, and are disposed to retract, on account of the loose cellular substance with which they are surrounded. At all events, if the surgeon choose to save the skin, let him not prolong the patient's sufferings by two formal distinct incisions, with an intermediate dissection of the integuments from the corpora cavernosa, as it will be quite sufficient to draw the skin a little way towards the pubes, when the amputation may be completed with a single stroke of the knife.

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* Loder Chirurgisch-Medicinische Beobachtungen, b. i. p. 81.

† Hey's Practical Obs. in Surgery, p. 478. edit. 2.

‡ Op. cit. p. 470.

§ Op. cit. p. 465.

When the penis is to be amputated near the symphysis of the pubes, the corpora cavernosa usually retract so considerably after their division, and lie so deeply concealed within the integuments, that the surgeon cannot discover, nor take up the bleeding vessels. In one example, says Richter, the arteries shrunk so far under the pubes, that they lay two inches within the extremity of the skin. Hence, in such an operation, instead of saving integuments, the surgeon should make a point of removing more of them than of the corpora cavernosa. This may always easily be accomplished, if the skin be drawn forwards towards the glans before the requisite division of the parts is performed; and if there were any difficulty experienced, it would be right to make the incision through the skin first, and cut through the rest of the penis afterwards, in such manner, as would guard against too considerable a retraction of the corpora cavernosa. †

As the hemorrhage after amputation of the penis is profuse, and often cannot be effectually restrained, unless the larger arteries are

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* See Hey's Practical Obs. in Surgery, p. 469. edit. 2.

† Richter, Anfangsgr. b. vi. pp. 185, 186.

secured with ligatures, it is a matter of great importance to do the operation in such manner, as will enable the surgeon to get at these vessels with the least difficulty; and hence the utility of abandoning the project of saving skin for the purpose of covering the stump. Without this precaution, as a modern surgeon has remarked, while the tedious business of getting the ends of the corpora cavernosa from beneath the integuments, by which they are concealed, and of finding out the arteries is going on, the continued bleeding often reduces the patient to the lowest state of weakness, and the practitioner is at last compelled to have recource to compression, styptic applications, cold water, or the cautery. Nor are these means always capable of stopping the hemorrhage in time, or in a permanent manner, the effusion of blood ceasing only for a little while; and their irritation always increases the inflammation of the stump, and protracts the cure. Thus, in one example, where the hemorrhage was considerable, the blood flowing not only from many conspicuous arteries, but oozing largely from the divided corpora cavernosa, Mr. Hey took up one artery on the dorsum penis, and one in each corpus cavernosum. The bleeding, which still continued, seemed then to be a general oozing from the wound; on which account he applied sponge to it. But this would not do; for, about an hour after the patient had been put to bed, the bleeding burst out again, and Mr. Hey was therefore obliged to remove the dressings, and take up three other arteries. A fourth vessel, which run near the urethra, bled a little; but as its extremity could not be clearly seen, a piece of sponge was laid upon it. On the third day a fresh hemorrhage came on, which made it necessary to remove the last portion of sponge, and take up the vessel under it, which now bled freely.* In another example, Siebold could tie only one artery, the others having shrunk so deeply, that they could not be discovered. After the patient had fainted, the bleeding stopped; but, it broke out again, and was at length checked with cold water. The weakness from loss of blood, was such, however, that the patient was a month in recovering his strength, and his feet continued for some time œdematous.† Joerdens saw a case in which the stump became retracted under the pubes, and a violent hemorrhage ensued, which nearly proved fatal, and could hardly be restrained in half an hour, by tying three arteries, and having recourse to compression, and a styptic liquor.‡ B. Bell was still more unfortunate; for he ventured to trust entirely to pressure, without taking up any of the vessels: the consequence was, that so copious a bleeding came on, a few hours after the operation, that the patient lost his life.§ In another case, the surface of the stump, which had been treated with compression and styptics, was long ill-conditioned, pale, and indurated, nor did the wound begin to diminish at all before the thirteenth day[*], in which space of time, another instance, treated differently, had completely healed.[†]

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* See Hey's Practical Obs. in Surgery, p. 465. edit. 2.

† Chir. Tagebuch, p. 52.

‡ Loder's Journal, 3 b. 1 st.

§ Syst. of Surgery, vol. i.

It appears that the corpora cavernosa have the greater tendency to retract, the nearer their division is to the pubes; and, on this account, it is alleged, that even when care has been taken to amputate more of them than of the integuments, their extremities will still frequently be deeply concealed, and the taking up of the arteries be difficult. Nor will the plan of encircling the stump with a tight piece of tape here avail in obviating the disadvantage of the retraction of the corpora cavernosa, and the immediate danger of hemorrhage, as the stump is short, and the band therefore liable to slip off. Even if the band could be fixed tightly on the part, it would only serve as a temporary means of stopping the bleeding, which would be renewed immediately the band was loosened for the purpose of enabling the operator to see the points from which the blood issues, so as to get at the vessels.[‡] This plan, however, has been adopted with success in Germany[§], and even Mr. Hey assures us, that, in one of his cases, he found great advantage from having applied some tape round the sound part, as he was thereby not only enabled to divide the integuments more easily and correctly, but was furnished with an useful kind of tourniquet, which kept the divided vessels from bleeding, till he was prepared to take them up with the tenaculum and ligature.[‖]

Were a case to present itself, in which the mouths of the arteries could not be found and taken up, the practitioner would be compelled to resort to means, which experience proves to have occasionally succeeded under similar circumstances; as, for instance, compression[¶], with agaric, sponge, or lint dipped in powder of gum arabic; ice-cold water[**], and the actual cautery[††], a circular band, strip of plaster, or tourniquet, &c. The uncertainty of all these methods, however, is generally acknowledged.

In order to prevent a closure of the urethra, as well as to enable the patient to make water easily, and keep the urine from coming into contact with the wound, many surgeons, as soon as the operation is finished, introduce a short silver cannula, or an ordinary catheter, into that canal. If the short cannula be chosen, it must be made with little rings, so that it may be conveniently fastened in its situation. Were the amputation about to be done towards the pubes, a silver catheter should be introduced before the operation, because here the retraction of the parts is such, that the introduction of the instrument afterwards might be found difficult, if not impracticable.

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[*] Schmalz in Loder's Journ. 1 b. s. 622.

[†] See Schreger's Chirurgische Versuche, b. i. p. 243.

[‡] Ibid. p. 247.

[§] Ollenroths, in Hufeland's Journ. 3 b. s. 56.

[‖] Hey's Practical Observations in Surgery, p. 478. ed. 2.

[¶] Dolignon, Journ. de Médecine, t. lxxxiii.

[**] Siebold, Chir. Tagebuch, p. 52.

[††] Sabatier, Médecine Opératoire, t. ii. p. 306. Ollenroths, Hufeland's Journal, 3 b.

With respect to the introduction of any tube, either before, or directly after the operation in ordinary cases, surgeons are not unanimous upon the subject. I have seen the operation done very well without it, and the parts favourably healed, a bougie having been passed a little way into the urethra once a day, after the removal of the dressings, to hinder the contraction of the orifice of the urethra. This was Mr. Hey's practice.

A flexible gum catheter is preferable to a metallic tube, since it creates less irritation. The irritation of the wound by the urine, and the necessity of hindering the orifice of the urethra from closing, will probably always lead many practitioners to pass a silver, or elastic gum catheter. The instrument, however, should be large, for otherwise the urine getting out between it and the urethra, and wetting the dressings, irritates and frets the wound. Le Dran mentions a case, in which, from the neglect to pass a catheter, the orifice of the urethra became impervious, so that the urine could not be discharged.* Bertrandi cites another case from the writings of Nannoni, where it became requisite to enlarge the orifice of the urethra by an incision, the surgeon not having taken the proper precautions soon enough after the operation, to hinder the closure of the opening. Desault also records an example, in which it was necessary to use caustic for the same purpose. If the operator should determine not to use such an instrument, he must at all events not save skin, as, when it is brought forward, it obstructs the flow of urine.

CHAP. XLIX.

STRICTURES OF THE URETHRA.

A STRICTURE of the urethra may be defined to be a preternatural diminution of the diameter of a part of that canal. By the late Mr. Hunter, strictures of the urethra were divided into three kinds; first, the true permanent stricture, arising from an alteration in the structure of the passage; secondly, a mixed case, composed of a permanent stricture and spasm; and thirdly, the true spasmodic stricture.† This mode of taking up the subject supposes the urethra to possess a natural power of contraction and relaxation, a circumstance which, though possibly true, and most commonly believed in this country, is not universally admitted; and abroad, especially in France, can be said to have very few advocates. It may be difficult, and perhaps impossible, (says Sir Everard Home,) to prove this membrane to be muscular, either from its appearance, or from examination of its texture, since the peculiar structure, upon which the contraction of a muscle depends, has not as yet been ascertained. Other structures, apparently membranous, and equally unlike the fasciculated fibrous texture commonly met with in muscles, are endowed with a power of contracting and relaxing, in a much greater degree, than is ever found to take place in the membrane of the urethra. The tænia hydatigenia ovalis, an animal consisting of a semitransparent membranous bag, met with in the brain, liver, and omentum of sheep, when taken from its natural situation, and kept in tepid water, contracts, and relaxes the different parts of its bag to a considerable extent.* The muscular structure of the ureters cannot be demonstrated; yet, no one doubts, that they possess a contractile power. Their function of conveying the secreted urine from the kidney to the bladder, requires the exercise of tonic powers; and the idea of this fluid finding its way by the force of gravity, is not only repugnant to the laws of the animal economy, but is irreconcilable with obvious phenomena. The adhesion of the sides of the tube, where it penetrates the coats of the bladder, presents an obstacle, which can be overcome only by the exertion of some force; and this obstacle is vastly increased in the distended state of the bladder, during which the fluid is constantly finding its way into this receptacle.†

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* Operations in Surgery, p. 158. ed. 2.

† See a Treatise on the Venereal Disease, p. 111. ed. 2.

In the same manner, although the muscular structure of the urethra cannot be demonstrated, many phenomena are in favour of the affirmative, and, at all events, leave no doubt of the canal possessing a power of altering its diameter. Here the functions of the part, and certain facts remarked in practice, afford a better criterion than anatomy, which, it is allowed, does not in this instance give us any kind of evidence; or what it is said to demonstrate upon this point, by no means tends to confirm the opinion of the urethra being a muscular as well as a membranous tube. I here allude more particularly to the ingenious observations of Mr. Shaw, who has discovered, that that there is in the membranous part of the urethra a vascular structure resembling the corpus spongiosum, and capable of injection. This anatomical fact, he conceives, may be taken to disprove the existence of muscular fibres in any part of the urethra, since what has been described as muscular fibres immediately under the mucous membrane, is the uninjected vascular texture of the internal spongy body ‡, the term applied to this newly remarked structure. Yet, there are various circumstances, which forbid us from coming to the decision, that the membrane itself of the urethra cannot be muscular. When the urine passes out, the canal is large; when the semen is thrown out, it is small. When a portion of its membrane is in an inflamed state from gonorrhœa, its surface is more readily stimulated, and the irritation of the urine makes it contract so much, that frequently the fluid is voided only by drops. In this state, if the penis be immersed in warm water, the urethra often becomes suddenly relaxed again, and the urine is more easily discharged. In many cases, the surgeon finds, when he attempts to introduce stimulating injections into the urethra, that they will not pass towards the bladder, but are rejected again with considerable velocity.

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* See Practical Obs. on the Treatment of Strictures, &c. by Sir E. Home, p.15. His subsequent observations, tending to prove the existence of longitudinal fibres on the outside of the lining of the passage, are noticed in my Surgical Dictionary.

† Rees's Cyclopædia, art. Kidney.

‡ See Medico-Chirurgical Trans. vol. x. p. 353, &c. 8vo. Lond. 1819.

Sömmerring refers the formation of strictures to a thickening of the diseased part, and does not appear to entertain any belief in the spasmodic nature of these cases.* The same opinion is professed by several modern French surgeons.† Mr. C. Bell believes, that the white condensed substance, which constitutes the most common kind of stricture, must be equally incapable of yielding to pressure and spasmodic action. He observes, that this fact of the firm nature of a stricture, pointed out by Mr. Hunter, is a sufficient proof, that a stricture cannot be spasmodic; and that even if the diseased part of the urethra were originally muscular and contractile, the condensation and callosity of the part must be attended with loss of such contractile power.

According to Mr. C. Bell, it is by confounding the effect of the proper muscles of the urethra, that the canal has been imagined to possess a muscular property. "I made (says he) the following simple experiment, in order to put this to the test. I got a small ivory ball, to which I attached a thread. I introduced the ball into the urethra. I made the man endeavour all he could to push it out, but he could not; neither was it retained in the slightest degree, when pulled by the thread. I thought it might be more satisfactory, if I imbued the ball with something stimulating. I tried coarse soap and spirits; but still there was no power in the urethra to retain the ball, or to push it forth. This could be done only by the urine behind it, and the operation of the bladder, or the ejaculator seminis. I need not add, that this experiment was made upon a part of the urethra anterior to the seat of the ejaculator seminis. In the course of practice, I find, that when the silver ball is introduced down to the ejaculator seminis, it is resisted by that muscle, especially when the parts are irritable. I find it sometimes thrown out of the grasp of the muscle; but when pushed fairly into the sinus of the urethra, which is into the middle of the muscle, the ball is allowed to remain."* The same person endeavoured to ascertain whether the urethra had any action on fluids. He employed a glass tube to throw an injection into the urethra, the end of the tube being constructed for passing into the orifice of the passage. Pressure was made on the urethra five inches down. By elevating the tube or column, the fluid distended the urethra; but no irregularity in the height of the fluid in the tube indicated any muscular power of the urethra to discharge its contents. When the urethra was distended, the slightest touch upon it with the finger elevated the fluid in the tube; but no effort of the patient produced the effect. When he made the effort, it was with the ejaculator seminis, behind the part of the urethra compressed by the fingers.† The conclusion, drawn by Mr. Bell, is, that the part of the canal, anterior to the muscles which surround it, has no muscular power.

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* Sömmerring, Abhandlung über die schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhre bey Männern im hohen Alter. Frankf. 1809.

† Delpech, Précis Elémentaire des Maladies, réputées Chirurgicales, t. i. pp. 554—556. 8vo. Paris, 1816. Richerand, Nosographie Chir. t. iii. p. 487, &c. edit. 4.

Mr. Bell thinks, that we can be at no loss to account for spasm in the posterior part of the urethra, since five inches of the canal in that situation are surrounded by muscles; the accelerator urinæ, or ejaculator seminis; the sphincter vesicæ, the compressor prostatæ, and the levator ani. And, he adds, that it must never be forgotten, that it is the sensibility of the urethra which governs their contraction.

The action of the muscles in the perineum, as an explanation of some of the phenomena remarked in cases of stricture, has been too much overlooked, and there can be no doubt that they in some degree have the effect, which the foregoing writer imputes to them; but, possibly, the membrane of the urethra may yet be itself endued with a muscular, or, at all events, a contractile power.

Mr. Shaw, who adopts similar views of this question to those entertained by Mr. C. Bell, reinforces the arguments of the latter, not only by additional reflections, deduced from a consideration of the action of the muscles in the perineum, as an explanation of some circumstances usually imputed to spasm of the urethra itself, but by referring a great deal to the natural elasticity of its membrane ‡, and adducing a mode of reasoning commonly employed by the French § and German surgeons, in their account of the formation of strictures. Thus, when a circumstance in this disease cannot be explained by the action of the ejaculator seminis and other muscles in the perineum, it is ascribed either to elasticity of the passage, or to a transient increased determination of blood into the corpus spongiosum, producing a temporary augmented diminution in the calibre of the urethra, and a fallacious appearance of spasm in that canal. *

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* Letters concerning Diseases of the Urethra, p. 95. 8vo. Lond. 1810.

† Ibid. p. 96.

‡ "The injection was expelled by the elasticity of the parts." Medico-Chir. Trans. vol. x. p. 546. The final expulsion of a bougie is referred to the same cause. Ib.

§ "N'a-t-on pas pris les commencemens de la coarctation aggravée par les augmentations passagères de l'engorgement des parois du canal, pour le spasme dont il s'agit." Delpech, Précis Elémentaire des Maladies réputées Chirurgicales, t. i. p. 556. 8vo. Paris, 1816.

However curious and interesting this question may be in an anatomical or physiological light, it is less important in a surgical point of view than may at first be imagined, since the treatment of strictures should in all probability be conducted on precisely the same principles, whether the spasm, that sometimes has a share in increasing the impediment to the exit of the urine, depend upon the muscularity of the membrane of the urethra itself, or upon the muscles situated near this canal. This, I conceive, must be the case, especially as the action of the muscles in the perineum is said by Mr. Bell himself to be entirely governed by the sensibility of the passage. I think, however, that the term spasmodic stricture might as well be dropped, and that no case ought to be called a stricture, until there is some permanent contraction, arising from a chronic thickening, or a change of structure, in the diseased part of the urethra. It has never been clear to me, that any material light is thrown upon the mode in which the disease is formed, by imputing so much to spasm as several writers have done; and whether the membrane of the urethra be contractile or not, a permanent stricture could never be formed without some process, by which the part is thickened, as well as constricted. According to Mr. Hunter, the disease generally occupies no great length of the passage; and in most of the cases which he had seen, it extended no further than if the part had been surrounded with a piece of packthread. Indeed, in many of the examples, the stricture is said to have presented a great deal of that appearance. Mr. Hunter adds, however, that he had seen the urethra contracted for more than an inch in length, owing to its coats, or internal membrane, being irregularly thickened, and forming a winding canal. † And Mr. S. Sharp, in speaking of strictures, informs us, that they happen sometimes to a small portion of the passage only; at other times, *to a very considerable length of it;* and, frequently, to three or four different parts of it. ‡ Sometimes also, two strictures form within an inch of each other, and the space between them is narrower than the rest of the canal.

A stricture, says Mr. Hunter, does not arise, in all cases, from an equal contraction of the whole circumference of the urethra; but, in some, from a contraction of one side. Sir E. Home has met with cases where there were three strictures, and all on the same side of the urethra, the other being perfectly smooth. This form of the disease throws the passage to the opposite side, and often renders the introduction of the bougie difficult. The contracted part is described by Mr. Hunter as being whiter and harder, than any other part of the urethra. Sometimes there are more strictures than one: Mr. Hunter met with half a dozen in one urethra, some of which were more contracted than others. Indeed, says he, many urethræ, in which there is a stricture, have small tightnesses in other parts of them.

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* Upon this principle, viz. the diminution of the canal by the swelling of the parts combined with irregular action of the muscles in the perineum, and of the detrusor urinæ, Mr. Shaw accounts for the stream of urine becoming smaller in gonorrhœa, or being quite stopped, and for the impossibility of throwing a stimulating injection into the bladder. Medico-Chir. Trans. vol. x. p. 347.

† Treatise on the Venereal Disease, p. 115.

‡ See Critical Inquiry into the present State of Surgery, p. 145. ed. 4.

DIAMETER OF DIFFERENT PARTS OF THE URETHRA.

The urethra naturally is not of the same diameter throughout its whole extent; and some parts of it are much more liable to stricture than others. In order to determine with precision the length as well as width of the urethra, Sir E. Home took exact casts of it in wax. The subjects from which they were taken were of different ages; one was between 70 and 80; the other 30. The length of the canal corresponded exactly in both casts. From the external orifice to the neck of the bladder was 9 inches; but, in a note, this gentleman observes, that, in a relaxed state, the canal is commonly about 8½ inches in length. From the external orifice to the bulb of the urethra was 7 inches. The membranous part, extending from the bulb to the prostate gland, 1¼ inch; and the canal passing over the prostate gland was half an inch in length.

The following were the diameters of the casts of the urethra in different parts: —

Years old	80	30
At ¾ of an inch from the external orifice	$\frac{9}{20}$	$\frac{7}{20}\frac{1}{2}$
At 4½ inches from the external orifice	$\frac{7}{20}$	$\frac{7}{20}$
At the bulb, 7 inches from the orifice	$\frac{12}{20}$	$\frac{13}{20}$
In the membranous part directly beyond the bulb, 7½ inches from the orifice	$\frac{7}{20}$	$\frac{4}{20}$
In the membranous portion near to the prostate gland, 8¼ inches from the orifice	$\frac{9}{20}$	$\frac{7}{20}$
Where the membranous part terminates, and the prostate gland begins, 8½ inches from the orifice	$\frac{11}{20}$	$\frac{10}{20}$
At the neck of the bladder, 9 inches from the orifice	$\frac{9}{20}$	$\frac{8}{20}$

These dimensions, it is to be understood, are much beyond those of the easy state of the urethra.

MOST FREQUENT SITUATION OF STRICTURES.

The two parts of the urethra, which are naturally the most narrow, are found also to be those most liable to stricture. In fact, strictures occur most commonly just behind the bulb of the urethra, the distance from the external orifice being 6½ or 7 inches. The situation, next in order of frequency, is about 4½ inches from the orifice of the glans. Strictures do also form at 3½ inches from this orifice, and sometimes almost close to it. Mr. Hunter never met with a stricture in that part of the urethra which passes through the prostate gland. In some cases, the external orifice itself is contracted.

In almost all the cases, which Sir Everard Home has attended, there was one stricture, about seven inches from the external orifice, whether there were others, or not.

SYMPTOMS OF STRICTURE.

It is noticed by Mr. Hunter, that most of the obstructions to the passage of the urine, if not all, are attended with nearly the same symptoms. Few patients notice the symptoms of a stricture, till they have either become violent, or have been the cause of other inconveniences. For instance, a patient may have a considerable stricture, without observing, that he does not make water freely; he may even have a tendency to inflammation and suppuration in the perineum, and not feel any obstruction to the passage of his urine, nor suspect that he has any other complaint, than the inflammation in the perineum. The stream of water becomes small, in proportion to the obstruction; but this symptom, though probably the first, is not always noticed by the patient. In some instances, the urine is voided only by drops, and then the disorder cannot escape notice; in others, the stream is forked, or scattered.* Although, as Sir E. Home observes, the first progress of the contraction is in general very slow, yet, when once it has so far increased, that the urethra is not wholly relaxed by the force of the urine, its subsequent advances are more rapid, and new symptoms are perceived. The urine is voided more frequently; does not pass without a considerable effort, attended with pain, and a straining continues after the bladder is emptied. If the patient accidentally catch cold, drink a glass of spirituous liquor, acid beverage, or punch, commit an excess in drinking wine, or remove quickly from a warm to a cold climate, the urine will pass only by drops, or be entirely obstructed; these causes inducing in the contracted part, or adjacent muscles, a spasmodic action, by which it is closed. Cold, externally applied to the body (continues Sir E. Home), has so great an effect upon a spasmodic stricture, or, as others would say, a stricture liable to be increased by spasms of the muscles in the perineum, that a patient, who can make water without the smallest difficulty in a warm room, upon attempting it in the open air, shall be entirely unable to void a drop; but, even in this difficulty, if he return to a warm room, and sit down some little time, the urine will come away. The symptoms of stricture come on more frequently when the patient is leading a sedentary, than an active life.

From the long continuance of strictures, the bladder becomes contracted. This is sometimes, as a late writer observes, merely a temporary affection; but, in other instances, it depends upon a changed organization of the bladder, and is then generally a disease for life. The muscular bands of the organ are enlarged, and its whole substance surprisingly thickened. In these cases, the urethra behind the stricture, and the ureters, instead of being contracted, like the bladder, are often greatly expanded.*

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* Hunter on the Venereal Disease, p. 112.

Permanent strictures are generally attended with a discharge of matter, or a gleet. This is often considered by the patient as the whole disease; and sometimes it is not till after the surgeon has long tried in vain every means, that he can imagine, to effect a cure, that other symptoms are noticed, and a stricture is at last suspected. In diseases of the urethra, and also in those of the prostate gland and bladder, there is generally an uneasiness about the perineum, anus, and lower part of the abdomen.

Intercourse with women generally renders strictures worse, the passage being left by it in an extremely tender state. The discharge of urine causes a great deal of irritation, and, in a few hours, a running of matter commences. In certain instances, the contraction is so great, that it stops the emission of the semen altogether, and forces it back into the bladder; while, in some other cases, this fluid passes through the stricture after the orgasm has taken place, but with little or no force.

There is one circumstance, which has a great tendency to make a stricture be mistaken for a gonorrhœa; viz. the pain in making water is confined to the same spot in both diseases. A stricture in the membranous part of the urethra does not render the part itself particularly sensible; but all the painful sensations are felt about an inch and a half from the orifice of the glans penis. This is a general fact, and unaccountable as it may seem, it is not more extraordinary, than the burning pain felt in the glans, in cases of stone, even when the whole of the urethra is perfectly sound.

When a stricture is in an advanced stage, the diseased part is at all times much narrower, than the rest of the canal. According to Sir E. Home, however, the stricture still retains a power of contracting and relaxing itself: in the contracted state, closing up the passage; in the relaxed state, allowing the urine to pass through it in a small stream.

The spasmodic contraction is indicated by the urine not passing in a stream; and by the extreme difficulty of now introducing a small bougie, which, in the relaxed state of the canal, met with no resistance. The bougie also, if allowed to remain a few minutes, is not unfrequently grasped so tight by the spasmodic contraction, that it cannot easily be withdrawn. When examined, it has an appearance exactly resembling what would have been produced, if a piece of packthread had been tied round it. In this stage, the spasmodic contractions, although more violent, occur less frequently, than while the stricture was in a more recent state. When the stricture has been of some years standing, the coats of the bladder become thickened; in which state, it does not admit of the usual dilatation, so that the patient is obliged to make water with great frequency.*

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* See a Treatise on Stricture of the Urethra, by James Arnott, p. 139, 8vo. Lond. 1819.

I have further to enumerate, amongst the effects of strictures, nocturnal emissions; and, in irritable patients, a variety of unusual sensations about the membranous part of the urethra, conveying to the mind the idea of something crawling, or fluttering. In many cases, there is a periodical discharge, brought on by cold, or other occasional causes. When this happens, the inflammation extends to the bladder; the frequency of making water is much increased; and the urine very turbid. Sometimes the bladder inflames more violently, and secretes purulent matter, which passes out after the urine. In still worse attacks, the discharge from this viscus is glairy, like the white of egg, and of a strongly tenacious consistence.

Attacks of the preceding kind may bring on peritonitis, and the patient be carried off. Sometimes also the incessant irritation of the strictured part, by the efforts to make water, brings on a gradual diminution of the canal, and, in a few instances, a total obliteration of a portion of it. This last event cannot happen without destroying the patient, unless another outlet be formed for the urine. Complete strictures, therefore, are only met with when fistulæ in perinæo have been produced.

Some patients are liable to complete paroxysms of fever; that is to say, they often have a cold, hot, and sweating stage of febrile disorder, in regular succession.

Strictures may give rise to a swelling of the testicle; and their irritation not unfrequently brings on hemorrhoids. Sometimes they occasion strangury and retention of urine. If a patient goes suddenly from a warm into a cold situation; if he drinks too freely of wine; eats high-seasoned dishes; catches cold; commits any species of intemperance, or delays making water too long, after feeling the inclination, he exposes himself to the danger of these latter grievances.

The affections, most liable to be mistaken for stricture, are spasm of the muscles surrounding the urethra; common inflammation of the passage; gonorrhœa; tumour, inflammation, or abscess in the neighbouring parts pressing upon the urethra; swelling of the lacunæ of the urethra; stone in this canal, or the bladder; and diseased prostate. In cases of stricture, the increase of the gleety discharge and pain, after coition, comes on suddenly after the cause, and, if left to itself, will generally decline in about a week. On the other hand, in gonorrhœa, a few days usually intervene between the exposure to infection, and the beginning of the symptoms, which then gradually increase to their acmé; and only begin to subside as late as ten days after their commencement. In gonorrhœa also the pain in making water is more severe.†

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* See Home's Practical Obs. on Strictures.

† See Arnott on Strictures, p. 49.

Obstructions from calculi in the urethra may be known by the preceding symptoms of gravel; by the collision of a sound against them; by the sudden sharp pricking pain which they excite; and often by their being obvious to the touch.

In cases of stone, the difference from stricture is proved by the stream of urine being generally full, and sometimes suddenly stopped; by the patient being able to make water more easily in some positions of the body, than in others; by there being no obstruction to the passage of instruments into the bladder; and by the possibility of touching the stone with a sound. A diseased prostate gland is to be suspected, especially in elderly persons, when a bougie will pass seven inches and a half without obstruction, but not into the bladder. The reason of this circumstance depends upon the fact of strictures being rarely more backward, than the beginning of the membranous part of the urethra. The swelling of the gland may also be felt within the rectum, and an elastic catheter can generally be got into the bladder.

CAUSES OF STRICTURES.

The origin of the disease is often imputed to the effects of gonorrhœa, or to the method of curing it. Mr. Hunter specifies various reasons against this doctrine. Strictures are common to most passages in the human body: they often occur in the œsophagus; in the intestines, especially the rectum; in the anus; in the prepuce, producing phimosis; and in the lachrymal duct; without any previous disease. They sometimes happen in the urethra itself, without ever having been preceded by gonorrhœa.* Mr. Hunter saw an instance of this kind in a young man of nineteen, who had had a stricture for eight years, and which therefore must have begun when he was only eleven years of age. He met with a stricture in a boy only four years of age, and a fistula in perinæo in consequence of it. He thought strictures as common in persons who had had gonorrhœa slightly, as in those who had had it violently. They never come on during the inflammation of a clap, nor for some time after the infection is gone. Thirty and forty years sometimes elapse, between the cure of a gonorrhœa, and the beginning of a stricture. If strictures arose in consequence of the inflammation accompanying this disorder, we should expect to find them of some extent, because the inflammation is itself of some extent; and we should also expect to find them most frequent in that part of the urethra which is usually the seat of gonorrhœa. But, they are not so frequent there as in other parts of the canal. Notwithstanding these arguments, the generality of surgeons still regard gonorrhœa as a frequent cause of strictures.

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* Arnott on Strictures, p. 52, 55.; also Macilwain on Strictures of the Urethra, p. 55.

Strictures are often supposed to arise from the use of injections in gonorrhœa; but Mr. Hunter saw as many strictures after gonorrhœas, which had been cured without injections, as after other cases, which had been cured with them. Such modes of accounting for strictures, he observes, give no explanation of cases which have not been preceded by gonorrhœa, or the use of injections.

The stone is sometimes a cause of stricture, and this occasionally happens in infancy. Sir E. Home has met with such cases in children only six years of age, and from other examples, which he has recorded, it would appear, that the disease is frequent in calculous patients of more advanced years.

In the East Indies, and other warm climates, strictures are much more readily brought on, than in Europe; and it is thought, that the excesses in which the inhabitants of hot countries indulge, have great effect in promoting the formation of the disorder.

Strictures have arisen from the application of external violence to the perineum; from the irritation of the membrane of the urethra by blisters; and from the irritation of a diseased prostate gland. Cases, in proof of these observations, may be perused in Sir E. Home's publication.

TREATMENT OF STRICTURES.

The first object is to ascertain the precise situation of the stricture nearest the orifice of the urethra. For this purpose, a common bougie, proportioned to the size of the aperture of this canal, is to be gently introduced. If it readily enter the passage, the surgeon may be well assured, that its size is not too large, and that no impediment to its further introduction, can proceed from this circumstance; for, the mouth of the urethra is naturally one of its most narrow parts. Small bougies, and such as are too much pointed, are apt to be stopped by the lacunæ, or orifices of the mucous glands, and to deceive inexperienced surgeons.

The surgeon should take hold of the penis, by placing the forefinger and thumb of his left hand on each side of the prepuce, opposite the corona glandis, so as to avoid making any pressure on the passage. The instrument having been oiled, is to be held like a pen, and introduced a little way at first; then the surgeon is to draw the penis forward, as it were, over it, with the index and thumb of his left hand, while he gently persists in pushing it further into the passage with his right hand. As it enters the urethra, it ought to be artfully rotated, first in one direction, and then in the other, in order that its extremity may not be entangled in any fold of the membranous lining of the passage. The situation of the stricture nearest the mouth of the urethra having been ascertained, the next desideratum is to learn, whether the contraction is such as would be produced by tying a piece of packthread round the canal; whether, on the other hand, it occupies a considerable extent of the passage; and lastly, what is the size of the bougie that can be introduced through it.

A knowledge of the extent of the stricture, if it could be obtained, would be of essential use in the treatment; because, I presume, when the obstruction extends far along the urethra, no surgeon would ever prefer caustic bougies. Those armed with the nitrate of silver, could never be expected to burn their way through a stricture an inch in length; and if other bougies, armed with the caustic potassa, are conceived to admit of being applied to such a stricture with any degree of precision, or any other real efficacy, than what actually arises from their mechanical action, when passed through the stricture, I confess, that it is more than my own observations authorize me to believe. In all cases of this description, as well as in others, in which two strictures are near together, and the intervening part of the canal much contracted, caustic bougies ought not to be used.

Having ascertained, that a common-sized bougie will not pass beyond a particular point of the urethra, the surgeon is to make an impression on the instrument with his nail, close to the mouth of the urethra. Then it should be withdrawn, and one of a smaller size taken, which he is to mark with his nail, exactly at the place corresponding to that of the impression on the first bougie. This smaller one is to be introduced so far as to bring its marked part exactly to the orifice of the urethra, at which period it is clear, that the extremity of the bougie has just arrived at the contraction, which would not allow the first common-sized bougie to pass. If the second bougie cannot be introduced further than the first, a still smaller one is to be tried; but the surgeon should not have recourse to the smallest bougies at once, as the largest, which can be insinuated through the stricture, ought to be the model of the soft white one, which should now be introduced for the purpose of shewing the shape and extent of the stricture, by the impressions made upon it. If, after the soft bougie has remained a minute or two in the stricture, it should be marked with a distinct circular, or semicircular narrow furrow on being withdrawn, probably the stricture does not occupy much of the urethra.

It is somewhat difficult to ascertain, by means of bougies, whether the diameter of the urethra is diminished behind the most contracted part of the stricture. Mr. C. Bell uses a particular sort of probe for ascertaining the extent of the disease. "I procured (says he) a series of silver and gold probes*, with circular knobs; the knobs varying from the full size of the urethra to what will just pass the narrowest stricture. By successively introducing smaller balls, I ascertain the degree of stricture by the ball which passes easily, and I am secure of being in the passage, by passing the probe onward, when it has got beyond the stricture. Then by the slight feeling of resistance in passing the ball, and in withdrawing it again through the obstruction, I ascertain the extent of the contraction. If the ball of this probe be liable, like the point of the bougie, to enter one of the lacunæ, or on passing it to rub upon its edge, yet by feeling whether the same roughness or difficulty attends the withdrawing of the bulb of the probe, as when it passed downward, we may be assured, whether there be a stricture of the canal, or whether the obstruction be not caused merely by the lacuna."* As the lacuna opens towards the urethra, its edge cannot catch the probe, while this instrument is being withdrawn, at which period an uniform smoothness must be felt, unless there be disease. When there is an irregular hardening of the urethra for a considerable extent, the probe moves along it with difficulty; but, no sooner has it passed the obstruction, than it moves on with freedom.

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* See Plate 7. figs. 1 and 2.

Likely as these ball-probes at first seem to be to afford desirable information, respecting the species of stricture, they are not much used. In fact, they do not answer; and it is the contractile power of the urethra, or (if others will not allow it) it is the action of the muscles contiguous to this passage, which sometimes stops the easy introduction of the probe even when there is no permanent stricture whatever, and which makes it more difficult to ascertain the nature and extent of the obstruction, than would otherwise be the case.

METHOD OF USING THE COMMON BOUGIE.

This instrument acts by producing a mechanical dilatation of the stricture. However, as it operates on living matter, it either makes the dilated part adapt itself to its new position, or recede by ulceration. If the case is one, that will allow even the smallest bougie to be introduced through the stricture, the cure may be considered as in our power. In many cases, in which the stricture is considerable, a great deal of trouble is given by spasms, which either prevent the introduction of bougies altogether, or only allow a very small one to pass. In such cases, Mr. Hunter sometimes made the bougie pass, by rubbing the perineum with one hand, while he pushed forward the bougie with the other. He also frequently succeeded, by letting the bougie remain close to the stricture, a little while, and then pushing it forward. The spasm (whether of the muscles in the perineum, or of the membrane of the urethra itself, is a matter of no great practical importance) has sometimes been removed by dipping the penis in cold water.

It is sometimes difficult to ascertain, whether a small bougie has passed through a stricture, or has only bent. In this case, a common-sized bougie should be previously introduced to learn the situation of the stricture, and afterwards, when the end of the small bougie is known to have reached the obstruction, the surgeon should push the instrument forward very gently, and for a short time. If the bougie enter further, he may know whether it has entered the stricture, by removing the pressure from the bougie; for if this recoil, it has not passed, but only bent. However, a very small bougie may bend, and yet not recoil.

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* System of Operative Surgery, vol. i. p. 104.

After the bougie has passed a little way through the stricture, and remained there a short time, we should withdraw it, and examine its extremity. If this be flattened, grooved, or have its waxen coat pushed up for some extent, or if a circular impression be made on it by the stricture, or a dent only on one side, we may be sure that it has passed, as far as those appearances and impressions extend.*

Now it becomes necessary to introduce another exactly of the same size, and to let it remain as long as the patient experiences no particular inconvenience. It is a rule in using the bougie, to avoid as much as possible subjecting the patient to great pain, either from the length of time during which the instrument is kept in the canal, or by the size of the bougie being too suddenly increased.

The best time for wearing bougies, is when the patient is in bed in the morning, or when he is not obliged to move about; and this may be done every day, every other day, or every third day, according to the degree of irritation excited. The bougie should be gradually increased in size, in proportion as the stricture dilates, till the largest one can easily pass, and its use should be continued three or four weeks longer, in order to habituate the parts to their new state.

Strictures are very liable to return, and hence, the treatment with common bougies has been accused of inefficacy. I have known some cases, however, in which the cure lasted many years; and others, in which the stricture returned, although caustic bougies had been employed. One reason, why the disease often relapsed in former times, was, because surgeons had no correct notions respecting the natural diameter of the urethra, and, consequently, they never increased the size of the bougie, as far as it ought to have been, in proportion as the disease gave way. On the other hand, in the practice with caustic bougies, surgeons have always given the preference to those of large size; and, if these instruments ever render the cure more durable than common bougies, or flexible catheters, I conceive, that the success is in a great measure ascribable to this circumstance.

One advantage, which common bougies have over those furnished with caustic, consists in their being calculated, when introduced into the bladder, to operate on several strictures at once.

The first introduction of a bougie sometimes produces extreme pain, fainting, shivering, &c.; but, in general, the second and every succeeding repetition of the operation can be borne better, and, at length, the inconvenience is but trivial. Sometimes, however, the irritation of the bougie is such as to compel the surgeon to discontinue its use for a time, and have recourse to antiphlogistic and anodyne remedies.

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* Treatise on the Venereal Disease, by J. Hunter, pp. 117—120. edit. 2.

The slipping of a bougie into the bladder is a serious accident, which may be prevented by tying round its outer end a piece of thread, which is to be carried over the dorsum of the penis, and there gently secured.

TREATMENT OF STRICTURES WITH ELASTIC GUM CATHETERS AND BOUGIES.

Perhaps there is no plan of treating strictures in the urethra, which is so mild and unirritating as that with instruments coated with elastic gum. Desault, who had considerable success in the treatment of strictures, rarely employed any means of cure, except an elastic gum catheter. That this instrument can frequently be introduced through a stricture, even when nothing else will pass, is well known to every practitioner; for, whether he is an advocate for one method of cure, or another, he no sooner fails in his attempts to get through a stricture, than he tries what can be done with a gum catheter. It is quite unnecessary to dwell on the mode of curing strictures with this instrument, or the elastic gum bougie. The cure is effected on the principle of dilatation; the very same principle, on which the common bougie operates. The catheter will sometimes pass without the stilet, when it will not do so with it. This instrument being much less irritating than a common bougie, can be longer worn without inconvenience, especially as the patient can also void his urine without taking it out. Indeed, it may be worn several days together, if judged advisable; but it is generally better to withdraw it sooner, and endeavour to get in another of larger size.

The elastic gum bougie sometimes will not pass a stricture situated about the bulb of the urethra, owing to the elasticity of the instrument keeping its point from ascending over a ridge on the lower side of the canal. On this account, I have found them in some cases not answer, and have been obliged to use either a common bougie, or an elastic catheter containing a wire.

METHOD OF USING BOUGIES ARMED WITH THE NITRATE OF SILVER.

A common bougie, of the same size as the armed one, is to be introduced, in order to measure exactly the distance of the stricture from the external orifice. This distance, being marked upon the armed bougie, the latter is to be oiled and passed down to the stricture, with which it is to be steadily held in contact, with moderate pressure at first, which is afterwards to be diminished, lest the bougie, when it becomes softened by the warmth of the urethra, should bend. The time which it is to remain, depends a good deal on the sensations of the patient, and the length of time the parts have been diseased; but, on the first trial, it should be less than a minute, as it then commonly gives greater pain, than at any subsequent application. Every other day appears, in general, to be as often as it is prudent to apply the caustic. In obstinate cases, however, Sir E. Home has applied it every day, and I have often done the same myself.

The bougie, introduced before the armed one, should be made of soft materials, that it may mould itself to the form of the passage, and communicate information relative to the size and position of the stricture.

In the course of the use of caustic bougies, especially when the patient is guilty of any imprudence, some unpleasant symptoms are liable to arise.

The first is a swelling in the perineum. It is very apt to be brought on when the surgeon is endeavouring to remove that part of the stricture which is nearest to the sides of the urethra. The swelling, which is of considerable size, is totally different from that which is produced by the long continuance of bougies in the passage, and ends in an abscess. It is entirely caused by blood extravasated in the cellular membrane, and is readily absorbed. The inflammation is also slight, and soon subsides. A second effect of caustic, in some particular cases, is a very profuse hemorrhage. Perhaps, one of the most alarming bleedings that ever took place from the urethra from such a cause, occurred in one of my patients, whose case I have elsewhere related. *

A third occasional ill-consequence of armed bougies, is strangury. Patients, who are subject to retentions of urine from the use of common bougies, are also not less liable to the complaint, when they are using armed ones, and sometimes they suffer in a still worse degree.

In certain constitutions, the application of caustic brings on ague. This is most common in patients who have passed much of their lives in hot climates; but it happens also in persons who have never been out of England. I once saw in St. Bartholomew's hospital, an elderly man, who had very bad strictures, for which the caustic was used. After the plan had been followed about a fortnight, a shivering fit came on directly after the application of the bougie. The method was discontinued for a time, and the man's health rather improved. The caustic was now repeated, and again a violent rigor immediately followed, and the febrile indisposition, which took place, proved fatal in a couple of days.

At present, caustic bougies are much less employed than they were some years ago. In France, however, and upon the continent in general, the practice never gained many partisans. The chief inducement, which rendered the plan a favourite one, depended

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* See Edinb. Med. and Surg. Journ. vol. v. p. 333.

upon its alleged superiority in radically curing strictures, and leaving no chance of a relapse. I believe, that this was only a supposition; for, I have known several returns of stricture after the use of caustic; and, if the disease should recur less frequently, it may be ascribed to the larger size of the armed bougies ordinarily employed. In all probability, common bougies would permanently cure strictures, quite as well as any armed ones, if care were taken only to increase the size of them, in proportion as the obstruction gives way.

For those strictures, however, which are like what would be produced by tying a piece of packthread round the urethra, perhaps armed bougies generally answer very well. They have also been particularly recommended for irritable strictures, the irritability of which is said to be destroyed with the diseased part of the canal. There are some cases, in which no bougie, nor catheter of the smallest size whatever, can be got through the obstruction. Here the surgeon has the choice of using the armed bougie; of exciting ulceration of the stricture with the pressure of a common one; of forcing a way through the obstruction with a conical silver catheter; or of dividing the stricture with a cutting instrument.

BOUGIES ARMED WITH CAUSTIC POTASSA.

Before this caustic is used, the urethra should be rendered sufficiently capacious to admit a bougie, above the smallest size, into the bladder, and the strictures, if very irritable, should have this irritability previously lessened by the use of common bougies.

The bougie is armed with the caustic potassa as follows: put a small quantity of this caustic upon a piece of strong paper, and break it with a hammer into pieces, of about the size of large and small pins' heads. Thus broken, it should be kept for use in a phial, closed with a ground stopper.

A proper curvature should be given to the bougie, by drawing it several times between the finger and thumb of the left hand, and it should be just large enough to enter the stricture with some degree of tightness. Then let it be passed gently into the urethra, and when its point stops at the stricture, which it almost always does before it will enter it, make a notch with the finger-nail on the upper portion of the bougie, exactly half an inch from the extremity of the penis. When the bougie is withdrawn, a small hole, about the sixteenth part of an inch deep, should be made at the extremity of its rounded end. Some of the broken caustic should then be put upon a piece of paper, and a bit smaller than the smallest pin's head, is to be selected for the first application. Let this be inserted into the hole of the bougie with a pocket knife, and pushed into it with the blunt end of a pin, so that it may be rather below the margin of the hole. To prevent the caustic from coming out, the hole should then be contracted a little with the finger, and the remaining vacancy in it filled with hog's lard. The bougie, being oiled, is to be passed with the curvature upward, to the anterior part of the stricture, the situation of which has been ascertained beforehand, and the bougie marked as already explained. The instrument should rest there for a few seconds, until the caustic begins to dissolve. It should then be very gently pushed forward, about one-eighth of an inch, when there should be another stop for a second or two. The bougie should next be carried forward in the same gentle manner, till it has passed through the stricture. After this, it should be immediately withdrawn, by a very gentle motion, to the part at which it was first made to rest awhile. Then it should be very slowly passed through the stricture a second time, but without letting the bougie stop in its passage. If pain or faintness arise, the operation is now to end, and the bougie is to be immediately withdrawn; but if no such effects be produced, the instrument may be passed, and withdrawn, once or twice more.

The application is to be repeated once every seven days, and if the stricture be found dilated, the bougie must be proportionally increased in size every time. In no cases, ought the piece of caustic to be larger, than a common pin's head.

By the above procedure, Mr. Whately asserts, that the caustic potassa is equally diffused over every part of the strictured surface, and only *abrades* the membrane of the stricture, without producing a slough. The objection to this practice consists in the impossibility of regulating the action of the caustic with the precision supposed, and in the questionable nature of its operation when thus employed. For my own part, I believe, whatever efficacy Mr. Whately's treatment possesses, arises from the mechanical effect of the bougies.

FLEXIBLE METALLIC BOUGIES, OR SOUNDS.

For some years past, a plan has prevailed of treating strictures with bougies, composed of a soft, flexible metal. They have a highly polished surface of a silvery hue, and as the diameter of some of them is considerable, they possess a sufficient degree of firmness, both for introduction, and for retaining the curve of the urethra. This last circumstance is considered by some practitioners a great advantage, exclusively belonging to metallic bougies. Hence, as soon as they have received the curvature which is judged to suit the patient best, they are carefully preserved in this form throughout the cure, and are kept in a case which has a corresponding shape. Formerly I have heard of objections to these instruments, on the ground of their being liable to break in the urethra; but although they are now oftener used, such an accident is much less frequent. Perhaps, this is to be imputed partly to their present composition, which is firmer, and less flexible, than it used to be some years ago, and partly to their present greater diameter. Many patients bear the employment of metallic bougies better than any others. It seems only necessary to add, that they effect a cure on the principle of dilatation, like common bougies.

The curvature of metallic bougies, and catheters, should always correspond to that of the urethra. Mr. Stanley has investigated, with great care, the natural curve of the membranous part of the urethra, where it passes under the arch of the pubes; and he finds, that an instrument, whose curve forms a considerable segment of a circle, one and a half, or two inches in diameter, while the rest of it is straight, is best adapted to the natural course of the passage.*

CONICAL SILVER CATHETER.

It is remarkable, that the French surgeons, who have always objected to armed bougies, which appear to them too violent a means of cure, have set the example of treating strictures on the principle of actual force. Mr. Cross recites a case which he saw in La Charité. A man, who had long had a permanent stricture, had been repeatedly treated for it. Unsuccessful attempts were made, for several days, to pass an instrument into the bladder by gentle means. The patient was still able to void his urine, although with great pain and difficulty. M. Roux took a conical silver catheter, with a very slight curvature, and an extremity almost pointed, and by force, regularly applied, he made his way into the bladder in spite of all opposition. He took care to keep the instrument central, and to judge of the direction of the point by the lateral rings. The rule mentioned by M. Roux, for commencing the great depression of the outer extremity of the instrument, was when, with the finger in the rectum, he could feel that the point had reached the apex of the prostate. He gave great pain to the patient, but succeeded in getting the instrument into the bladder. The urine in the bladder was not suffered to flow out immediately, the catheter being left in the urethra, and its end plugged up with a piece of wood. Three or four days, is the time M. Roux commonly keeps the conical catheter in the passage; but, this patient suffered so intolerably, that it was taken out at the end of four-and-twenty hours. An elastic gum catheter of a small size, was immediately introduced without difficulty; its extremity fastened to the abdomen; and its orifice plugged up, in order that the urine might be allowed to flow only at certain periods. The next day, the patient was comparatively easy. On the fourth day, there was a swelling of the testicle, scrotum, and perineum. A poultice was applied, and the elastic catheter continued. In four days more, the swelling of the parts had subsided, and the poultice was no longer necessary. A fresh gum-catheter, of a larger size, was introduced. Suffice it here to add, that, in about six weeks, a catheter of the largest size could be introduced.

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* See Macilwain on Strictures.

Another case went on less favourably. The *sonde conique* had been employed, and a gum catheter introduced. But, in less than a week, the patient, believing he could make water without the instrument, took it out himself. The next day, an effusion of urine in the scrotum had taken place, and the fluid was freely let out by two long incisions. The elastic catheter, however, could not be introduced again. The urine now came away in drops from the urethra. The free incisions in the scrotum prevented sloughing; but the patient, who was very weak, and in bad health, died in a few days. It was (observes Mr. Cross) an inveterate case of stricture, and the patient would probably have died under any treatment. Dissection shewed a diseased bladder, whose coats were above half an inch in thickness, a cartilaginous stricture, and extensive sinuses communicating with the once membranous part of the urethra.

" The effecting of a speedy cure, in bad cases of stricture," is the argument advanced by the French surgeons for the use of the conical catheter, where that of elastic gum cannot be introduced without its assistance. They tell us, (says Mr. Cross,) even of bad cases being cured, or greatly relieved, in a month, or six weeks; and certainly in one case, under M. Roux, a catheter of the largest size could be received by the urethra, a month from the introduction of the conical catheter.

From this treatment, M. Roux had never seen any inflammation, or irritation, which was not readily subdued. In his clinical lecture, however, he mentioned two fatal cases which he had witnessed, and examined after death. In one of these, on taking out the silver catheter on the third or fourth day after its introduction, the surgeon could not introduce the gum catheter; in attempting to do which, a false passage had been made. Extravasation of the urine, sloughing, and death ensued. The second case was somewhat similar: peritoneal inflammation was the immediate cause of its fatal termination, the instrument having passed between the pubes and anterior part of the bladder.

Whoever desires more information, respecting this violent mode of treating strictures, must consult Mr. Cross's publication.* It is a dangerous plan, which can only be justifiable in the most inveterate and obstinate cases. In such examples, the late John Hunter, Desault, Dease, and others, used the silver catheter with considerable force; and the practice of Mr. Pearson and Sir A. Cooper, is likewise cited, as a sanction of this bold proceeding. The French even sometimes prefer this way of puncturing the bladder, the catheter being forced through the prostate gland; and I have heard of one or two distinguished surgeons in this country, who never perform any of the ordinary methods of puncturing the bladder, but invariably force a catheter into that organ, through the prostate gland.

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* Sketches of the Medical Schools of Paris, p. 111, &c. 8vo. Lond. 1815.

Another modern writer, who censures the above hazardous mode of forcing a conical sound into the bladder, adopts the practice of cutting down to the stricture, after introducing a silver catheter, and then pierces the obstruction with a trocar. "The stricture (says he) is here the cause of the obstruction: why should it not be opened and the bladder relieved? since it not only affords a passage to the confined urine, but lays a foundation for a radical cure. This operation, when performed for a stricture of the urethra, (not curable by other means,) and where there is no complication, nor destruction of parts by the extravasation, is perfectly successful. I believe this manner of relieving the bladder would be more followed, if surgeons were aware, by as many proofs as I have before me, that *the membranous part of the urethra is always dilated in stricture.*" * Here the safest way of operating seems to me to be that described by Mr. Hunter, which will be noticed in the following chapter.

In examples of this description, small instruments have been usually preferred, in order that they may pass when the spasm has yielded; but Mr. Arnott recommends passing down to the stricture a large cannula, with a rounded end, which being pushed against the stricture, opens it, while a small bougie, or catheter within it, is ready to be passed through. †

OF THE INSTRUMENT CALLED A DILATOR.

This apparatus consists of a tube of oiled silk, lined with the thin gut of some small animal to make it air-tight, and fixed on the extremity of a small cannula, by which it is distended with air, or water from a bag, or syringe at the outer end, while a stop-cock, or valve, serves to keep the air in when received. Though Mr. Arnott finds, that it generally passes down to the stricture as easily as a small bougie, he sometimes prefers introducing it through a smooth cannula, especially when the urethra is irritable. As soon as the bag is sufficiently within the stricture, or strictures, as much air is to be injected into it, as the patient can easily bear. The dilator is said to act with more effect than a bougie, which, as soon as it yields, loses its power of distention, while the force of the dilator is concentrated at the stricture, and unceasing. ‡ In principle, it is exactly like the contrivance used by Bromfield for dilating the female urethra, for the purpose of extracting a calculus; but, for the perfection to which the contrivance has been brought, and for the suggestion of an immense number of circumstances, under which it may prove useful, the profession is indebted to Mr. Arnott, and his brother.

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* C. Bell Surgical Obs. vol. ii. p. 56. 8vo. Lond. 1818.

† On Stricture in the Urethra, &c. p. 120.

‡ Arnott on Stricture, &c. p. 96, &c.

OF A NEW PASSAGE.

The greatest evil arising from the improper use of the bougie, and the most dangerous, is the formation of a new or false passage. This is generally occasioned by an attempt to force a firm inflexible instrument, like the conical silver catheter, through the stricture, or to excite ulceration by the pressure of the end of the bougie against the stricture, when an instrument cannot be passed through it. It may also be produced by caustic. After such an evil has once happened, a bougie can rarely be prevented from going into the new passage, so as to be completely hindered from acting on the stricture.

In this circumstance, Mr. Hunter recommends the following operation: Pass a staff into the urethra, as far as it will go, which will probably be to the bottom of the new passage, and beyond the stricture. Feel for its end, and cut upon it, making the wound about an inch long, if the disease be before the scrotum; and an inch and a half, or more, if in the perineum. If the new passage be between the urethra and body of the penis, you will most probably get into the sound urethra, before you come to the instrument, or new passage. If so, introduce a probe into the urethra, through the wound, and pass it towards the glans penis, or, in other words, towards the stricture. When it meets with an obstruction, this must be the stricture, which is now to be got through, and afterwards dilated. To complete the operation, withdraw the probe, and, instead of it, introduce a hollow cannula forwards to the stricture. Then introduce another cannula from the glans downwards, till the two tubes are opposite each other, with the stricture between them. An assistant is now to take hold of the urethra on the outside, with his finger and thumb, just where the two cannulæ meet, in order to keep them in their places. Through the upper cannula next introduce a piercing instrument, which is to perforate the stricture, and enter the lower cannula. The piercing instrument is now to be withdrawn, and a bougie introduced through the first cannula and stricture, into the second cannula. The tubes are to be taken out, and the end of the bougie, in the wound, directed into the bladder, through the further portion of the urethra. It may also be necessary to lay the whole of the false passage open, in order to make it heal.

The longer the first bougie is allowed to remain in the canal, the more readily will the second pass, or rather an elastic gum catheter, which, in this case, is a far better instrument.

CHAP. L.

FISTULÆ IN PERINÆO, AND EXTRAVASATIONS OF URINE.

When the urethra is very much obstructed, nature often endeavours to procure relief by ulceration on the inside of that part of the urethra, which is within the stricture. The urine then insinuates itself into the loose cellular membrane of the scrotum and penis, and becomes the cause of suppuration, wherever it is diffused, and even of mortification, first, of the cellular substance, and then of several portions of the skin. If the patient survives, the sloughs are detached, leaving a free communication between the urethra and external surface. Every opening, thus produced, is termed a *fistula in perinæo.*

Sometimes the urine finds its way into the corpus spongiosum urethræ, becomes diffused through the whole of this texture, and injected into the glans penis, producing mortification of the parts in which it is lodged. It appears also possible for the urine to pass into the cavernous substance of the penis, instead of into the common cellular membrane. In one example of this kind, recorded by Mr. C. Bell, erections took place from this cause, followed by mortification. * Even when the urine is contained in the common cellular membrane of the scrotum, the irritation may give rise to suppuration in the corpus cavernosum. † The lodgment of calculi at the stricture, and the increased obstruction thereby produced, sometimes produce ulceration of the urethra, and a dangerous effusion of urine.

In particular instances, the urine does not spread so extensively; but is confined in a sort of pouch, its diffusion being prevented by the adhesive inflammation; and, on other occasions, instead of insinuating itself extensively into the cellular membrane, it is not only circumscribed, but presents itself in a purulent form, having excited inflammation and suppuration in the part. These circumscribed partial effusions of urine are never seen, except in cases where the urethra is either not obstructed at all, or only imperfectly so; for, when the stricture is complete, and no urine whatever can pass, if the urethra ulcerate, the contents of the bladder always flow so suddenly and copiously into the cellular membrane, that the extravasation immediately occupies a considerable extent. It is clear also, that, while no outlet for the urine exists, the effusion must continue to spread, and the mischief to extend.

Abscesses in the perinæum, sometimes communicating with the urethra, and sometimes not, may be brought on by the irritation of bougies; a fact of which all surgeons should be aware.

When the effused urine forms only a circumscribed tumour, an incision may be made into the swelling, and an elastic gum catheter introduced and worn. When the effusion is extensive, and strictures are the cause, a complete cure cannot be accomplished without removing them. But, in general, this indication cannot be fulfilled in time to prevent all the mischief arising from extravasation of urine. An attempt, indeed, should be made to pass a bougie; for, sometimes, the stricture is, more or less, removed by the ulceration. When this is the case, Mr. Hunter advises the almost constant use of bougies, in order to procure a passage into the bladder. However, if it were possible, in this state of things, to introduce a bougie through the whole course of the urethra, the most advantageous plan would be that of keeping an elastic gum catheter continually in the passage: for it would at once conduct the urine outward, hinder any more from being effused, and act, like a bougie, on the remains of the stricture. In cases of this nature, the larger the catheter that can be introduced the better, as it will not only act more quickly on the remains of the stricture, but be more likely to hinder further extravasation.

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* Surgical Observations, vol. i. p. 98.

† Vol. cit. p. 102.

While measures are taken for curing the stricture, every thing calculated to diminish inflammation, is to be put in practice. Proper incisions for the discharge of the urine, emollient poultices, and fomentations, bleeding, and exposing the parts to the steam of hot water, are especially proper. Opium, given by the mouth, and in clysters, and the employment of the warm bath, are the best means of lessening any spasmodic affection. Too frequently, however, no bougie, nor elastic catheter, can be introduced; the evils arising from the effusion of urine are pressing; and no immediate hopes of overcoming the obstruction can be reasonably entertained.

In these cases, we are advised by Mr. Hunter to empty the bladder, and prevent the further effusion of urine into the cellular substance, by introducing a staff into the urethra as far as the stricture; cutting down on the extremity of the instrument, and extending the incision a little farther towards the anus, so as to open the urethra beyond the stricture.*

When the stricture is opposite the scrotum, Mr. Hunter recommends an opening to be made into the urethra in the perineum; but, here, we cannot have the end of the staff to guide us, and we must trust to our anatomical knowledge. The rest of the operation resembles that for the cure of a false passage. A flexible gum catheter should then be introduced, and the wound healed.

When the total obstruction of the urethra and the extravasation depend upon the lodgment of calculi at the stricture, the plain indication is to make an incision down to the extraneous substances, and extract them.

Practitioners, unaccustomed to see the consequences of urinary extravasations, would be alarmed at the magnitude of the ulcer, which is occasionally left after the detachment of the sloughs.

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* Treatise on the Venereal Disease, p. 146. edit. 2.

Sometimes the whole scrotum and the integuments of the penis, groins, perineum, and upper part of the thighs, are attacked with mortification, and the naked testicles are seen in the middle of the enormous sore, suspended by the spermatic cords.* It is hardly conceivable, how cicatrization can take place over the testicles, thus denuded; but the resources of nature are found to be infinite. She causes the testicles and spermatic cords to unite to the subjacent parts, and, by drawing the skin from the circumference towards the centre of the sore, she covers those organs, and forms for them a new investment, like a scrotum. If we except the introduction of the catheter, which is absolutely necessary for a complete cure, and the practice of making timely incisions for the discharge of the effused urine, surgery can afford the majority of patients little, or no useful aid; for, when they are not debilitated by the long existence of the disease, are of good constitutions, and in the vigour of life, they recover with as much expedition and certainty under a proper regimen and with simple dressings, as if internal medicines, and a farrago of topical applications were employed. Desault's practice consisted in applying emollient poultices, until all the sloughs had separated. The ulcer was then dressed with pledgets, or dry lint, which was continued to the end of the treatment. When any complication occurred in the course of the case, an endeavour was made to remove it by means suited to the indication which it presented. Thus, when there was prostration of strength, bark and cordials were exhibited. But, in every instance, the elastic gum catheter was the essential means of cure.†

In old fistulæ in perinæo, where the dangers, arising from the diffusion of urine, are past, the surgeon is to make the natural passage as free as possible by the use of bougies and catheters; for the fistulous openings often heal up, as soon as the urine finds a ready passage through the urethra. When they do not, they are to be laid open, in the same manner as other sinuses. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff introduced, if possible, into the bladder, and a probe passed into one of the fistulous passages. Here it is essential to remark, that however numerous the external openings may be, fistulæ in perinæo never have more than one internal opening, by which they communicate with the urethra, and which is almost invariably on the inferior side of the canal, or that nearest the external surface of the body. The probe should be first bent, in order that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better; for then the operator can cut just what is necessary.

When the fistula will allow a director to be introduced, this is the best instrument. If, as Mr. Hunter observes, neither the probe nor the director can be made to pass as far as the staff, we must open as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of opening it.

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* See Cases illustrating these observations in Mr. C. Bell's Surgical Observations, vol. i. pp. 90—94.

† Œuvres Chir. de Desault, tom. iii. pp. 286, 287.

After the fistulæ have been divided, as far as their termination in the urethra, a gum catheter should be introduced, and worn; but when the sores become stationary, the catheter should only be kept in the passage occasionally; for its continual presence sometimes prevents cicatrization.

Fistulæ in perinæo, attended with most unyielding strictures, sometimes occur, where it is proper to cut through the obstructed portion of the urethra, and then pass an elastic catheter into the bladder; but, the difficulty of tracing the urethra in the thickened and diseased state of the scrotum is sometimes very great, such, indeed, as in one or two cases that fell under my notice, completely baffled a professed anatomist. The difficulty is well explained in an example recorded by Mr. C. Bell.*

The cases, published by Sir Astley Cooper † and Mr. Earle, exemplifying the possibility of curing, on Taliacotian principles, large fistulous openings, the consequences of the destruction of large portions of the urethra, by sloughing or ulceration, are truly interesting, and ought to encourage other practitioners not to renounce such cases as hopeless.

CHAP. LI.

RETENTION OF URINE.

When the urine cannot be discharged, the bladder generally becomes distended in an extraordinary degree. In an infant, eighteen months old, it has contained a pint of fluid; and, in adults, six or seven pints. It has been known to occupy, not only the whole cavity of the pelvis, but to ascend into the abdomen, higher than the umbilicus. It has sometimes extended itself even through the abdominal ring, or under the crural arch, into the groin, so as to form an inguinal, or a femoral hernia.‡ In ordinary cases, the bladder preserves nearly its natural figure; yielding, however, more from below upwards, than in any other direction. Its lower part becomes broader and more deeply situated, depressing the perineum; in women, pushing the vagina backward; in men, the rectum; and occasioning in these passages a tumour, which more or less fills up their cavity, and, in the intestine, may actually obstruct the feces. The posterior parietes of the bladder, covered by the peritoneum, push the small intestines upwards and backwards, and rise into the abdominal cavity; while its fundus, in rising above the pubes, glides betwixt the peritoneum, and the abdominal muscles. Its anterior superior part, which forms a swelling in the hypogastric region, is actually in contact with the recti and transversales muscles. This circumstance ought to be understood, because it shows, how the bladder may here be opened, without the peritoneum being wounded, and an extravasation of urine produced. Not unfrequently, between the fleshy fasciculi of bladders, which have been much distended, pouches, or cells, are observed, containing calculi. When the urine has dilated the bladder to the utmost, without the obstacle to its natural escape through the urethra being removed, it next accumulates in the ureter, which, with the pelvis of the kidney, becomes enormously distended. The valvular contrivance, by which the ureter terminates in the bladder, now disappears, and the opening sometimes becomes nearly an inch in diameter. At length, there being actually no room for more urine, the secretion is suppressed.

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* Surgical Obs. vol. i. p. 128.

† Surgical Essays, part 2. Phil. Trans. 1821.

‡ See Récherches sur la Hernie de la Vessie, par M. Verdier; in Mém. de l'Acad. de Chir. tom. ii. 4to.

The symptoms of a retention of urine are of the following kind; either no urine has been discharged for a more, or less considerable time; or what comes away is voided by drops, or in inconsiderable quantities at a time. There is a strong and incessant desire to make water, attended with a sensation of weight about the perinæum, tenesmus, constipation, and sometimes hemorrhoids. An acute pain is experienced in the hypogastric region, extending along the urethra to the glans penis, and, after a time, to the kidneys. The pain is increased, when the patient walks, coughs, or holds himself in an upright posture; but diminishes when the body is inclined forward, and the abdominal muscles relaxed. These symptoms are accompanied with fever, and if no relief be afforded, the breathing becomes difficult; copious sweats break out, which have an urinary, or ammoniacal smell; the belly grows tense; and hiccough, vomiting, coma, and delirium indicate the near approach of death. In certain examples, the usual quantity of urine daily dribbles away; and yet the bladder is constantly distended. The symptoms, which more certainly than any others, indicate a retention of urine, are; first, the swellings formed by the distended bladder above the pubes, and in the rectum, or vagina; and secondly, the fluctuation, which is plainly felt, when the tumour above the pubes, and that in the rectum or vagina, are touched together.

The only cases, in which these latter symptoms would be absent, are a few, in which, though a complete retention exists, the unyielding and contracted bladder contains but a few spoonfuls of urine.*

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* Œuvres Chir. de Desault, tom. iii. pp. 112—116.

A retention of urine is an urgent case, and always requires prompt succour. If relief be too long delayed, the consequences are distressing; for the bladder, when long distended, loses its contractile power, which can only be slowly recovered, if recoverable at all: and, what is still worse, if the stoppage of the urine be complete, and remain unrelieved a certain time, the bladder inflames, some point of it sloughs, and a dangerous extravasation of urine follows, generally ending in the patient's death.

The progress of these cases, when timely relief is not afforded, always varies according to circumstances. 1. When the bladder has been distended in a certain degree, and the cause of the retention is not such as to close the urethra, the contents of the bladder, at length, begin to be discharged by drops; yet, this viscus is not emptied; and though the distention and fulness do not augment, they continue in the same degree as they did previously to the escape of urine from the urethra. It is this sort of retention which may last several weeks, without producing further dangerous consequences. 2. When the disorder is owing to a total closure of the urethra, the distention and fulness of the bladder increase, until at last this organ inflames, a part of it sloughs, the urine is effused, and the patient frequently loses his life. Sometimes, however, and, probably, when the slough is, as it were, only a speck, the bladder bursts at the affected point, the urine becomes diffused in the surrounding parts, and the patient becomes suddenly freed from the preternatural distention of that organ. The result of the case now depends on the situation of the slough in this viscus. For the most part, the breach is formed in the vicinity of the neck of the bladder, so that the urine is extravasated in the cellular membrane of the perineum and scrotum, and fistulæ in perinæo take place.* Sometimes the slough opens a passage for the urine into the rectum, and this fluid is suddenly discharged with the stools. The bladder occasionally bursts at its superior and anterior part, and the urine becomes diffused in the cellular substance of the abdominal muscles. When its fundus bursts, its contents may be effused in the cavity of the abdomen, and the consequences be fatal. Sometimes, the urine is discharged at the navel, especially in children, one example of which I have met with myself. In this instance, a preternatural pouch forms, which occasions a fluctuating tumour at the umbilicus, and, at last, the swelling inflames and bursts.

In every retention of urine, two chief indications present themselves: the first is to procure a timely evacuation of that fluid, in order to prevent the serious consequences already specified: the second is to obviate the causes, which hinder its expulsion.

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* In the urethra, ulceration occurs, as I have described in the chapter on *fistula in perinæo.*

RETENTION OF URINE FROM PARALYSIS OF THE BLADDER.

In this case, the passage for the urine is open; but the bladder has not the power of contraction. The nature of the disorder is distinguished by the foregoing cause, and by the facility with which the catheter can be introduced.

In persons of advanced age, the bladder becomes less sensible to the stimulus of the urine, and loses the power of contracting sufficiently to expel the whole of its contents. This is the first degree of the retention of urine, common to old subjects, and originates in a very gradual manner. The urine flows in a full, but a weak stream, and towards the end of every evacuation, the water only comes away by drops. The quantity of urine expelled at a time, by degrees gets smaller and smaller, until at last a perfect retention occurs.

This species of the disorder is often imputable to a pernicious habit of not taking sufficient time to discharge the whole of the urine. Sometimes, it is owing to an injury done to the loins, and is then usually attended with a paralytic affection of the lower extremities. Most frequently it is produced by an unusual distention of the bladder, whereby this organ is deprived of the power of contracting itself. The distention occurs, either in consequence of retaining the urine too long, after an inclination to void it is felt; or in consequence of another species of retention, which has only attained a certain degree.

The paralytic retention of urine is not so dangerous as the other kinds, especially those produced by a closure of the urethra; inflammation and sloughing of the bladder seldom resulting from it. No sooner is the bladder distended in a certain degree, than the pressure of the abdominal muscles causes a partial discharge of its contents. This case is very liable to be mistaken for an incontinence of urine, partly on account of the urine dribbling away, and the usual quantity being evacuated in the course of the day; partly, in consequence of the patient himself being able by an effort of the abdominal muscles, and pressing the lower part of the belly, to make the urine flow out in a stream.

There are two indications: the first is to draw off the fluid distending the bladder; the second is to restore the natural contractile power of this receptacle; in accomplishing which latter object, it is necessary to pay particular attention to the cause of the disease.

The catheter serves to draw off the water, and its introduction should never be delayed; for, the distention of the bladder, and the loss of its contractile power, are continually increasing, and, of course, a radical cure is thereby rendered more and more difficult.

When the contractile power of this viscus is totally lost, the whole of the urine cannot be discharged even through the catheter, more especially when the patient is lying upon his back. In this case, the evacuation must be promoted by pressure on the lower part of the abdomen, and change of posture.

The second indication is to restore the contractile power of the bladder; for, as long as this faculty remains unrecovered, the distention and fulness are sure to recur. Hence, an accumulation of urine must be prevented by the employment of the catheter, which should be introduced several times in the course of twenty-four hours. When the patient, on account of his remoteness, cannot be visited repeatedly, it is better to keep an elastic gum catheter in the urethra.

When the catheter is left in the passage, the urine should not be allowed continually to dribble away through it. Desault found, that the bladder was longer in recovering its tone, when constantly relaxed, than when it was allowed to be sometimes flaccid, and sometimes moderately filled with urine. Hence, either the opening of the catheter may be stopped, and the urine drawn off every two or three hours, or the tube taken out altogether, and introduced merely when the urine is to be discharged. If the instrument is to remain any length of time in the passage, it must be withdrawn, and cleaned, every six or eight days.

Together with the use of the catheter, means, calculated to restore the contractile power of the bladder, ought to be employed, as the tincture of cantharides internally, blisters on the sacrum, cold bathing, &c.

When the loins are injured, topical bleeding, cold lotions to the part, ammoniacal liniments, blisters, and electricity, may be tried. Retention of urine is often merely a symptom of another disease, the removal of which is the main object.

When the bladder can completely empty itself, the catheter is no longer necessary; but the surgeon must assure himself by an introduction of the instrument, that this is really the case; for, if any of the urine remain undischarged after each evacuation, the quantity will gradually increase, and a complete retention take place again.

CATHETER.

Some of these are inflexible, being generally composed of silver; while others are both flexible and elastic. The common inflexible catheter is a silver tube, the diameter of which will not prevent its being introduced with facility into the urethra. Its shape and length vary, according as it is intended for the male, or female subject. A common male catheter is ten or eleven inches long. In general, when the urethra is free from obstruction, a large catheter, like a large bougie, will enter the bladder with more ease than a smaller one, because less likely to be entangled in the lacunæ. One third of the catheter, towards its point, should be moderately bent, the curvature being the segment of a circle about six inches in diameter; the other two-thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easily introduced, than when it is very much bent. As I have already noticed, however, the natural curve of the membranous part of the urethra, according to Mr. Stanley's observations, would require a considerable segment of a circle only an inch and half, or two inches in diameter. The female catheter is about six inches long, and straight, excepting a slight curvature towards its point.

An elastic gum catheter has the advantage of being less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes. In cases of obstruction in the urethra, they can also frequently be got into the bladder, when a silver catheter will not pass.

Sometimes the instrument is difficult of introduction, owing to a spasmodic affection of the urethra itself, the muscles of the perineum, and the sphincter of the bladder. In this case, before a second attempt is made, a dose of opium may be administered. When inflammation is present, the introduction will often be facilitated by venesection and the warm bath.

The introduction of the catheter may be performed, when the patient is either standing up, sitting, or lying down; but that posture, in which the patient reclines on a couch or bed, is reckoned the most advantageous.

One of the most important maxims is never to force forward the instrument, when it meets with any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances: Its beak may be pushed against the os pubis. This chiefly occurs, when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be the cause of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may be entangled in a fold of the lining of the urethra; and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which event force can be of no service, and may be productive of great harm. Hence, it is always proper to withdraw the instrument a little, and then push it gently on in a different position.

As Richter states *, the operation in the male subject may be divided into three stages: in the first, the catheter passes that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; in the third, it enters this

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* Anfangsgr. der Wundarzn. b. vi. p. 232, 233. ed. 1802.

gland and the neck of the bladder. In the first stage, little trouble is usually experienced; for, the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance: The penis should be held, by placing the corona glandis between the thumb and the index-finger of the left hand: in this way, the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward, with moderate force. The catheter, being well oiled, is now to be introduced, with its concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this occurs, and the beak of the instrument has passed under the arch of the pubes, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and in proportion as this is accomplished, the beak of the instrument becomes elevated, and glides into the bladder. When the beak of the catheter is stopped by the os pubis, the impediment is to be avoided by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubes.

When the membranous part of the urethra is pushed to one side or the other, the catheter is to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index-finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and guiding the extremity of the catheter.

When the prostate gland is enlarged, the urethra generally turns upward very suddenly, just before its approach to the bladder, and of course in this case, the end of the catheter should be more bent upward than the rest of its curvature. According to Desault, a large catheter here usually answers better than a small one, and it may either be of silver or elastic gum. The latter, though the best for the purpose of being kept in the passage, has not always sufficient firmness to get through the obstruction in the canal, not even with the aid of the stilet. In this respect, a silver catheter is sometimes preferable. But, whatever may be the kind of catheter employed, it generally passes as far as the prostate with perfect facility, where it is stopped, not only by the narrowness, but also by the new curvature of the passage; for, the prostate cannot be enlarged, without pushing forwards and upwards, or to one side, that portion of the urethra, behind which it is situated. This is a circumstance which ought never to be forgotten, in regulating the length and direction of the beak of the catheter, which should be longer, more bent upwards, and more elevated at the time of its introduction, than in any other cases of obstruction in the urethra.*

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* Œuvres Chirurg. de Desault, t. iii. p. 223.

In swellings of the prostate gland, the late Mr. Hey found, that, by withdrawing the stilet of an elastic gum catheter, the instrument became more curved; and he availed himself of this information, by withdrawing the stilet, as he was introducing the catheter beyond the arch of the pubes, by which artifice, the point of the instrument was elevated in the due direction. His stilets were made of brass wire, about one tenth of an inch in thickness.*

When such experiments fail, the surgeon should try catheters of various sizes and curvatures.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland, and neck of the bladder. The chief impediments to its passage in this situation arise from a spasmodic contraction of the neck of the bladder, and from the instrument being pushed against the prostate gland. The first obstacle may be generally obviated by waiting a few moments, and gently rubbing the perineum, before the catheter is pushed on. How the impediment, caused by the prostate, is to be eluded, the reader will understand from what has been already stated. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra.†

In cases of enlarged prostate gland, Desault appears to have set the example to the French surgeons, of sometimes forcing a catheter into the bladder: after being tolerably certain (says Bichat) that the end of the catheter corresponds exactly to the direction of the urethra, and that the obstacle to its entrance into the bladder only depends upon the narrowness of the canal, we may, without being too fearful of making a false passage, forcibly push forwards the catheter. It was acknowledged by Desault, however, that this plan would be attended with great danger in the hands of young inexperienced surgeons; and that it is only fit to be practised by those, who, combining great experience in the use of the catheter with an accurate knowledge of the different curvatures of the urethra, have at length attained that degree of skill, which never lets them forget for an instant the situation and direction of the beak of the catheter. For if, while the instrument is forced on, the beak should be inclined too low, or to one side, &c., a false passage would inevitably be occasioned by a laceration of the membranous portion of the urethra; an accident, which is always of a serious nature, increasing the inflammation of the prostate, and rendering the introduction of the catheter more difficult.‡ This bold practice, suggested in France by Desault, is now frequently pursued by Boyer and Roux, and sometimes in this country by Sir Astley Cooper, Mr. Pearson, &c.*

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* Practical Obs. in Surgery, pp. 397, 398. edit. 2.
† Anfangsgr. der Wundarzneykunst, band vi. p. 240.
‡ See Œuvres Chir. de Desault, t. iii. pp. 224, 225.

A catheter is sometimes introduced as far as the perineum, with its convexity towards the abdomen; the point is then kept stationary, while the handle is made to describe a semicircular movement downwards, so as to bring the concavity of the instrument towards the pubes, as it is situated in the common method.

When there was difficulty in introducing an elastic catheter with a stilet, Desault used sometimes to withdraw the wire about an inch, in order to allow the end of the instrument to become more curved; a method somewhat similar to the plan recommended by the late Mr. Hey; but, with this difference, that the latter gentleman withdrew the stilet for the purpose of making the catheter bend more upwards at the moment when the beak of the instrument had arrived at the obstruction, over which it was wished to make it ascend.

INFLAMMATORY AND SPASMODIC RETENTION OF URINE.

Inflammation, occasioning this complaint, is frequently situated about the neck of the bladder, in the urethra, or adjacent parts. The difficulty of voiding the urine is to be attributed partly to the spasmodic affection of the urinary passage itself, partly to the action and resistance made by the sphincter and muscles in the perineum, and partly to the swelling arising from the inflammation. When the inflammation, however, is not situated in the urethra and neck of the bladder, but in some neighbouring part, not sufficiently near for the swelling to have the effect of compressing the urethra, the immediate cause of the impediment to the expulsion of the urine must then be referred either to the resistance of the muscles abovementioned, or the contractile power of the urethra itself.

From these remarks it must be clear, that, in the retention of urine, now under consideration, both antiphlogistic and antispasmodic remedies are principally indicated. It is commonly believed, that a mere inflammation of the neck of the bladder may occasion retention of urine; but Desault † thought the complaint generally owing to inflammation in the vicinity; because, inflamed muscles are not prone to contract.

The inflammation, causing retention of urine, may arise from various circumstances; violent fits of the stone; very bad piles; the use of stimulating diuretic medicines, especially cantharides; the absorption from blisters; bruises of the perineum; inflammation and abscesses about the perineum and anus, &c. But the most frequent exciting cause of the spasmodic, or inflammatory, retention of urine, is the irritation produced by strictures, and virulent gonorrhœa. From this account it is manifest, that besides taking care to employ antiphlogistic and antispasmodic remedies, it is also necessary to pay attention to each particular cause of the irritation.

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* See Cross's Sketches of the Medical Schools of Paris, p. 115. 8vo. Lond. 1815.

† Œuvres Chirurg. tom. iii. pp. 147, 148.

The most powerful means for relieving this retention of urine, are copious venesection; the application of leeches to the perineum, or vicinity of the os pubis; the exhibition of opium by the mouth, and in clysters; the warm bath; tobacco in the form of an enema; and fomentations to the hypogastric region, and perineum.

When these measures have been fairly tried, without success, the catheter is to be used; for the continued lodgment of the urine, and the distention, arising from its quantity, may soon cause paralysis of the bladder, and, in the course of three or four days, sloughing, and a fatal extravasation of urine; but if no kind of catheter can be introduced, not even a small one coated with elastic gum, and the other remedies and artifices spoken of in this chapter, and that on strictures, prove unavailing, it becomes necessary to puncture the bladder.

CHAP. LII.

PUNCTURING THE BLADDER.

Many patients who undergo this operation unquestionably lose their lives; but the frequent ill success should not be referred to the dangerous nature of the operation itself, so much as to the very diseased state of the urethra, bladder, and kidneys, often existing together with great debility, an impaired constitution, and a mass of abscesses and thickened parts, more than enough to account for the unfortunate result. Hence the surgeon, who wishes to have greater success, must not let the disease attain so incurable a degree, and, in particular, should let out the urine at an earlier period, than is usually done. I think it has been my lot to see several patients lost chiefly in consequence of this maxim not having been duly observed. We can hardly suppose, that a small wound, made in such parts as are divided in the operation, would of itself often give rise to the fatal termination of these cases. It has always appeared to me, that when the means, best calculated to promote the discharge of urine have failed, after having had a fair trial, the making of an outlet for the urine, either by puncturing the bladder, or opening the membranous part of the urethra, according to circumstances, becomes immediately as much indicated, as the division of the stricture in cases of strangulated herniæ, when other means have not had the desired effect of liberating the bowels.

Mr. C. Bell states, that the fifth, sixth, and seventh days, from the commencement of the total obstruction, are those on which the urine may escape from the bladder into the abdomen; and, consequently, he recommends the operation to be performed on the fourth day.*

Although I am an advocate for not delaying the operation, after milder methods have decidedly failed, I believe, that these methods will almost always prove successful in skilful hands, and that it may generally be avoided. In the opinion of Desault, there are very few instances in which a surgeon, expert at introducing the catheter, cannot pass it into the bladder, and, consequently, the cases, in which paracentesis is absolutely necessary, must be unfrequent.

The bladder may be punctured, either in the perineum, above the os pubis, or through the rectum. Of the first operation I shall say nothing, for it is now almost exploded. I allude to the old method of opening the bladder, with a trocar, between its neck and the insertion of the ureter; for, cases frequently present themselves, in which letting out the urine by an incision in the perineum, is much more advisable, than either puncturing the bladder from the rectum, or above the pubes. But the operation to which I refer, is not a hazardous thrust of a trocar at a point between the neck of the bladder and the insertion of the ureter, a point which can never be hit with certainty; but, a simple incision in the dilated membranous portion of the urethra. "If," says Mr. C. Bell, "a man have a stricture in the urethra, and the surrounding parts be indurated, so that there is no immediate hope of removing it by the caustic, or the bougie; if, with this, there have occurred a sudden obstruction, and the bladder has risen and has lost its action, and there remains no expectation of spontaneous relief, or of ease from lesser remedies, then I apprehend it is better to open the urethra in the perineum behind the stricture. And, this is to be immediately done, if the symptoms indicate a rupture of the urethra, and effusion of urine."†

In retentions of urine from strictures, not admitting of relief by other means, Sir Astley Cooper also prefers the making of an opening in the urethra to the practice of puncturing the bladder, which, in male subjects, he considers hardly ever necessary. In them, retention of urine mostly arises either from strictures, or disease of the prostate gland. Of the latter, Sir Astley has never seen a case in which a catheter, of proper form and size, could not be passed.‡

OF THE PUNCTURE ABOVE THE PUBES.

Some surgeons make a perpendicular incision, about an inch and a half or two inches in length, through the integuments and fat, covering the lower part of the linea alba. The lower the incision is made, the nearer it is to that part of the bladder, which it is most advisable to puncture, and the further it is from the peritoneum.

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* Operative Surgery, vol. i. p. 515.

† Surgical Obs. vol. ii. p. 61. 8vo. Lond. 1818.

‡ Lectures, vol. ii. p. 515.

Hence, the inferior end of the wound should be directly above the pubes. A trocar, the curvature of which forms a segment of a circle seven inches in diameter, is now to be introduced through the linea alba into the bladder. It is to be held with its convexity towards the patient's navel, and pushed obliquely downward, and backward in the axis of that viscus. Sir Astley Cooper, who uses a straight trocar, directs it towards the basis of the sacrum, and not so low down as I have always seen done; his reason is, that the risk of the instrument slipping between the pubes and bladder may be avoided.* At all events, it is necessary to guard against this accident, which has frequently happened. A curved instrument of this kind is much less likely, than a straight trocar, to penetrate the back part of the bladder, and wound the rectum; besides, having this advantage, that, when the urine is evacuated, and the bladder collapses, the cannula will not be so apt, as a straight one, to be separated from the part, in which it has been introduced. † Here we may discern another reason for making the puncture immediately above the pubes, and not an inch or two higher up, as Sharp and B. Bell have recommended: the bladder, which rises up between the peritoneum and recti muscles, descends again, when the urine is discharged, and, consequently, must be more liable to slip from the cannula, the higher the puncture is made. ‡

When the operator perceives, by the want of resistance, that the point of the instrument is in the bladder, he is to take hold of the cannula, and push it further in, while he withdraws the stilet. After the urine has been discharged, some practitioners, amongst whom is Sir Astley Cooper, pass an elastic gum catheter, duly shortened, into the bladder through the cannula, and then take the latter out.

An elastic gum catheter does not fill the wound; consequently, the urine is discharged, not only through it, but also between its outer surface and the track of the wound, so that the chance of the urine becoming diffused in the cellular membrane is not guarded against, as it is by allowing the cannula to remain in the wound two or three days, until inflammation has agglutinated together the surrounding cellular substance. In some examples, the cannula, after having been kept a few days in the wound, was taken out, and readily introduced again, as occasion required. §

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* Lectures, vol. ii. p. 309.

† Sabatier, Médecine Opératoire, tom. ii. pp. 128, 129.

‡ Richerand, Nosographie Chir. tom. iii. p. 499. By the employment of a long trocar, of course the objection here specified might be removed; but the cannula of such an instrument has sometimes pressed against the opposite side of the bladder, and caused an ulcerated opening in it. If the patient be not very fat, Flurant's curved trocar, about five inches long, is an eligible instrument for the operation; the cannula of a shorter one is liable to slip out of the bladder, and make a repetition of the puncture necessary, as happened in the practice of Professor Schreger. See his Chirurgische Versüche, b. i. p. 212. Nurnberg, 1811.

§ See Bohn über Harnverhaltung und Blasenstich, Leipzig, 1794; Noel in Desault's Journal de Chirurgie, tom. ii.; Turner, in London Med. Journal, vol. xi.; Journal de Médecine, tom. lxxxiii.

Still, I do not feel authorised to recommend this proceeding; because it has happened, that the tube could not be replaced, and the urine became confined again, so that a repetition of the operation would have been absolutely necessary a third time, had not Schreger succeeded in procuring an evacuation through the urethra, by distending this canal with warm water, injected with some force into the passage by means of a syringe and a cannula, introduced as far as the stricture would allow.*

Long, straight, silver cannulæ have been known to form a communication between the bladder and rectum, in consequence of ulceration, or sloughing, produced by the pressure of their points on the back part of the bladder. Mr. Sharp saw this accident†; and a modern author informs us, that, in a case where a common trocar was used, he dissected the parts; "the bladder fell on the sharp edge of the trocar, this produced inflammation of the bladder and peritoneum, which occasioned the death of the patient."‡

The outlet, thus formed for the urine, is, of course, merely designed as a temporary one, until the impediment in the natural passage has been removed. In one case, seen by Sir Astley Cooper, where the latter object had not been accomplished, twelve months after the puncture, a female catheter was yet worn in the opening.§

This operation has the advantage of being generally done at a distance from the diseased parts, and without risk of injuring any parts of importance. The chance of extravasation of the urine is not great. It is even conceived by a modern writer, that it should never be mentioned as an argument against this mode of puncturing the bladder, because when the cannula happens to slip out of the puncture, the little wound becomes impervious. In fact, this happened in Schreger's case, where the tube slipped out twice; viz. on the evening of the day on which the bladder was first tapped; and again on the third night from the second performance of the operation; for, after each displacement of the cannula, no probe could be passed into the bladder, no urine escaped, and that receptacle became enormously distended again. In other cases, however, to which I have referred, this closure of the puncture immediately after the displacement of the cannula did not happen; it did not occur in an example related by Schreger himself, in which he took out the cannula of the trocar on the thirteenth day, and put in another ||;

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* Versüche Chirurgische, b. i. p. 216. 8vo. Nurnberg, 1811. In cases of retention of urine, from calculi lodged near the neck of the bladder, Schreger employed the same artifice with success. It is this principle of distending the urethra with fluid, that has been so strongly recommended by Mr. Arnott in various affections of that canal; a subject to which I have adverted in a previous chapter.

† See a Critical Inquiry into the Present State of Surgery, p. 127. edit. 4.

‡ See a History of the High Operation for the Stone by Incision above the Pubes, and an Account of the various Methods of Lithotomy, by J. C. Carpue, p 176. 8vo. Lond. 1819.

§ Lectures, vol. ii. p. 310.

|| Versüche Chir. b. i. p. 225.

and it is therefore not to be regarded by any means as an invariable consequence of the tube slipping out. The displacement of the cannula, the possibility of not being able to get in another, and of an extravasation of urine, therefore, may still be considered objections to this method of operating. Another disadvantage is, that the opening is not made in a depending situation, and consequently the whole of the urine cannot be readily discharged. I have more than once seen this operation attempted, without the trocar reaching the bladder, or any urine being voided; and Mr. Carpue speaks of a case, in which the instrument, on going into the bladder, had pushed this viscus from its slight connexion with the pubes.*

PUNCTURE THROUGH THE RECTUM.

The patient is to be put in the posture recommended for lithotomy. An assistant is to make pressure on the abdomen, just above the pubes, in order to render the prominence of the bladder more distinct to the surgeon's finger in the rectum. A curved trocar, with its point drawn within the cannula, is to be introduced with the right hand, and conveyed, upon the index-finger of the left, along the swelling, formed by the distended bladder. It should be kept exactly in the central line of the front portion of the rectum, and, when beyond the prostate gland, should be pushed into the bladder, through the anterior part of the intestine, as nearly as possible in the middle of a triangular space, bounded at the sides by the vasa deferentia and vesiculæ seminales, which converge to the prostate gland, and behind by the line at which the peritoneum is reflected. If the puncture be made in the centre of this space, while the bladder is distended, there will be no danger of wounding the vasa deferentia, or vesiculæ seminales; and it may be made an inch behind the prostate, without risk of injuring the peritoneum †.

This operation is so easy, safe, and free from severity, that it certainly merits a general preference. The coats of the rectum and bladder, at this part, are in immediate contact, and the instrument has to penetrate no thickness of substance. Sir Astley Cooper objects to it, on the ground that the irritation of the urine is likely to bring on disease of the rectum; a case, which Dr. Cheston met with: but I do not find this consequence noticed by other writers on the subject, who have had occasion to perform the operation.

In a former edition of this book, the directions which I gave for puncturing the bladder from the rectum, appeared to Mr. Carpue objectionable, inasmuch as the space beyond the prostate, where the puncture can be made, without any risk of wounding the peritoneum, is very short.‡ When first I heard of this criticism, I thought it of value, and my mind was quite open to conviction, as the only real wish ever entertained by me was to give such views of the practice of surgery as may be most beneficial to the afflicted. At the same time, it seemed to me rather extraordinary, that, though the operation had usually been done very much in the way explained in my book, and perhaps without due attention to the very short space, naturally left between the prostate and the cul-de-sac of the peritoneum, yet, I had never in the course of my reading met with any notice of the peritoneum having been thus injured. Future reflections have now persuaded me, that, just and accurate as Mr. Carpue's statement is, with respect to the anatomy of the parts in the healthy state, it is far from being so in regard to the same parts, in retentions of urine. In these cases, as Desault has correctly pointed out, the bladder spreads more from below upwards, than in any other direction. Its inferior portion becomes broader and more deeply situated, pushing the perineum downwards and forwards, and the rectum backwards. The posterior part of the bladder, which is covered by the peritoneum, lifts the mass of small intestines upwards and backwards, and rises into the cavity of the belly.* When these changes are considered, together with the universal expansion of the bladder in its distended state, we shall immediately see, that the lowest point of the peritoneum, where this membrane is reflected from the posterior part of the bladder to the rectum, must become considerably displaced in the direction upwards and backwards, and a much larger space be left for the safe introduction of the trocar, than would present itself in the natural state of the parts. I offer these remarks, however, only in explanation of what I had some difficulty in making out when I first heard of Mr. Carpue's observation, due attention to which I still consider highly necessary.

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* A History of the High Operation, &c. p. 177.

† Sir A. Cooper, Lectures, vol. ii. p. 511.

‡ A History of the High Operation for the Stone, &c. by J. C. Carpue, pp. 178—180.

Perhaps no harm would generally result from immediately withdrawing the cannula. An instance is upon record †, where the cannula was inadvertently withdrawn forty-eight hours after the operation, and could not be introduced again. The urine was discharged through the rectum six days; and as soon as it began to flow through the urethra, the wound healed, without leaving any fistulous communication between the bladder and the intestine. The cannula has even been withdrawn immediately after the operation, without any inconveniences.‡ A case, however, is mentioned by a modern surgeon, in which the cannula slipped from the wound on the seventh day, and as the bladder became distended again, a second puncture was considered necessary, and performed with success.§ The safest practice, therefore, is that of keeping a tube in the puncture, until the impediment to the patient's making water in the natural way is removed; but, I would recommend the silver cannula to be withdrawn, on account of its annoyance, as soon as a flexible gum catheter has been introduced through it; a plan directed by Sir Astley Cooper.* The catheter is to be fastened to a T bandage.

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* Œuvres Chir. de Desault, t. iii. p. 115.

† Bentley in Medical Communications, vol. i.

‡ Richter's Ansfangsgründe der Wundarzneykunst, band vi. p. 328. edit, 1802.

§ Carpue on the High Operation, &c. p. 178.

The operation of puncturing from the rectum is not eligible when the prostate gland is very much enlarged; when there are large hemorrhoids present; or when the rectum is diseased.

In women, the meatus urinarius is so capacious and short, that a catheter may almost always be introduced; but, if there were a necessity for puncturing the bladder, as there may be in a retroversion of the womb, the operation above the pubes is decidedly better, than tapping the bladder from the vagina, which, though very practicable, is apt to be followed by urinary fistulæ, a very distressing disease, always difficult of cure, and often incurable.

CHAP. LIII.

INCONTINENCE OF URINE.

An inability to retain the urine in the bladder is of three kinds: in one, the water continually dribbles away, without any inclination to void it, or any sensation of its being voided. In other instances, the patient can hold his urine in a certain degree; but, the propensity to evacuate it comes on so frequently, suddenly, and irresistibly, that he is compelled to discharge it. The third kind of incontinence only occurs when the patient is asleep.

The first case depends on a weakness, or total paralysis, of the sphincter muscle of the bladder. As the neck of this organ is constantly open, every drop of urine escapes into the urethra, immediately it has descended from the ureters, and does not lodge in the bladder at all. Sometimes the weakness, or paralysis, of the sphincter is quite a local disorder; but, most frequently, it is symptomatic of some other affection. In the first case, it is often the consequence of a difficult labour, in which the neck of the bladder has been a long while compressed; or of the distention, caused by a stone in this situation. Sometimes, incontinence of urine depends on a malformation of the urinary passages, and exists from the time of birth. The complaint is often an effect of apoplexy, injuries, and diseases of the spine, &c.

It is not dangerous, though exceedingly annoying, in consequence of its continually wetting the clothes, causing a disagreeable smell, and even excoriating the parts, over which the urine flows.

When the complaint is local, tonics and astringents are indicated;

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* Lectures, vol. ii. p. 512.

and the principal remedies are, cold bathing, bark, blistering the sacrum or perineum, the tinctura cantharidum, the shower-bath, electricity, and rubbing the spine and sacrum with stimulating liniments.

When the incontinence of urine is merely an effect of another disorder, the latter claims the principal attention.

The second species of incontinence of urine is of a spasmodic nature, and commonly depends on some irritation operating on the bladder. Hence, the indication is to find out the irritation, and, if possible, to remove it. Hemorrhoidal complaints, suppressed menses, a stone in the bladder, a fistula in ano, &c. may cause the affection. When the particular irritation cannot be discovered, general soothing and antispasmodic remedies, such as opium, the warm bath, fomentations, &c. should be prescribed. The uva ursi is useful, of which a scruple, or half a drachm, may be given three times a day.

This kind of incontinence of urine is frequently only a symptom of epilepsy, or hysteria. Sometimes, it originates from pressure made upon the bladder; and hence, it may be a symptom of polypi of the uterus, a prolapsus of this viscus, or difficult parturition.*

The last case is that, in which the urine is involuntarily discharged in the night-time, when the patient is asleep. The infirmity is mostly met with in young boys and girls; and, for the most part, spontaneously goes off as they approach the adult state. They should avoid drinking any fluid just before going to bed, and empty the bladder before they go to sleep.

When, in adult persons, the complaint does not yield to the above precautions, one-fourth of a grain of the powder of cantharides, given with milk of almonds, every evening, has been known to be of service. The effect of exhibiting a grain of opium, or two grains of ipecacuanha, every night, a little before bed-time, may also be tried.

In this treatise, I have not thought it necessary to describe any particular apparatus for catching the urine, in cases where no cure can be accomplished.

There is a particular incontinence of urine, arising from the formation of a preternatural communication between the bladder and vagina. It is usually the consequence of a slough, and sometimes follows difficult labours. The continual dribbling of the urine, through the opening, generally prevents it from healing; but, by making the patient lie a good deal on her abdomen, the water is hindered from constantly escaping, and the aperture will sometimes heal.

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* Retention of urine, from paralysis of the bladder, is a case attended with an involuntary dribbling away of this fluid, if the catheter be not properly employed, and is a disorder that has frequently been mistaken for an incontinence of urine. As soon as the bladder is distended to a certain degree, the urethra being unobstructed, the continued secretion from the kidneys, instead of causing the bladder to give way, passes off through the natural channel. The discharge of urine leads the unwary surgeon never to suspect the real nature of the disease; but if a catheter chance to be introduced, the quantity of urine drawn off, immediately throws light upon the true character of the disorder.

Attempts have been made to close the preternatural opening, by scarifying its edges, and keeping them afterwards in contact with the twisted suture. If such an operation were practicable, it would be proper to make the patient lie on her abdomen, as much as possible, for two or three days, till the suture were removed.

CHAP. LIV.

FISTULA IN ANO.

This term is applied to every abscess in the vicinity of the anus; but very improperly; for, the idea of there being a fistula naturally leads to the adoption of measures, totally different from those which are applicable to common abscesses.

Sometimes, the complaint makes its attack, in the form of phlegmonous inflammation, attended with sympathetic fever. A part of the buttock near the anus is considerably swelled, and has a large circumscribed hardness, the middle of which soon becomes very red, and matter forms in its centre.

On other occasions, the fistula in ano begins as an erysipelatous inflammation, without any of the circumscribed hardness, which characterizes the preceding tumour. The redness spreads more extensively; the disease is more superficial; the quantity of matter small; and the cellular membrane sloughy to a considerable extent.

Sometimes, the complaint begins somewhat like a carbuncle. The skin is of a dusky red, or purple colour, and, although harder than in the natural state, not nearly so tense as in phlegmonous, or erysipelatous inflammation. At first, the pulse is full and hard; but, if no relief be obtained, it soon becomes unequal, low, and faltering; and the strength and spirits are greatly dejected. The matter, formed under the skin, is small in quantity, and bad in quality, and the cellular membrane is in a sloughy state. This species of the disease affects persons, whose habit is either naturally bad, or has been rendered so by intemperance.*

These different affections often influence parts in the neighbourhood of the disease. Hence, retention of urine, strangury, prolapsus ani, tenesmus, piles, diarrhœa, or obstinate costiveness.

Sometimes the fistula in ano first appears as an induration of the skin near the anus; but without pain, and alteration of colour; which hardness gradually softens and suppurates.

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* See Pott's Chirurg. Works, vol. iii.

The matter may either point in the buttock, at a distance from the anus; or near this latter part; or in the perineum. The matter may escape from one opening, or from several. Sometimes, there is not only an external aperture, but another internal one communicating with the cavity of the intestine. In other instances, there is only one external, or internal opening.

The matter may be formed at a considerable distance from the rectum, which is not even laid bare by it; in other cases, it is laid bare, but not perforated; sometimes it is both denuded and pierced.

From what has been already stated, it will be seen, that many abscesses about the anus are connected with a bad state of the health. When quite a local disease, it is said generally to arise from obstinate costiveness, and the irritation of the muscles and cellular tissue of the rectum by the passage of indurated feces. Severe diarrhœa, accompanied with tenesmus and great determination of blood to the rectum, has also been known to bring on the complaint. But, according to Sir Astley Cooper, the most common cause is disease of the liver, which, preventing the free return of blood from the intestines, and influencing their secretions, leads to inflammation at the anus.*

When the inflammation is phlegmonous, the thinner the skin is suffered to become, before the abscess is opened, the better. If the patient be of a full, sanguine habit, venesection, leeches, and mild purgatives, are proper in the early stage. The confectio sennæ with sulphur is one of the most eligible aperient medicines. An emollient poultice is the best application; and, if the pain be very severe, leeches and fomentations should be employed.

When the attack is of an erysipelatous kind, and there is a sloughy state of the cellular membrane, the sooner the part is opened the better. As Mr. Pott observes, if we wait for the matter to point, we shall wait for what will not happen, at least, not till after a considerable length of time, during which the disease will extend itself, and the cavity of the abscess be greatly increased.

When the fistula in ano commences with that kind of inflammation which a carbuncle exhibits, no evacuations are necessary. The part should be opened early by a very free incision.

In opening all abscesses about the anus, the incision should divide the whole of the skin covering the matter. Thus the abscess will be discharged at once; future lodgment of matter will be prevented; and convenient room will be made for the application of proper dressings.

All fistulæ in ano do not necessarily interest the rectum; sometimes the matter is so distant from the intestine, that the surgeon has no more to do with this part than if it did not exist, and the abscess is to be treated upon general principles.

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* Lectures, vol. ii. pp. 327, 328.

The idea of callosity, naturally attached to the term fistula, is the great cause, why former surgeons were in the habit of distending abscesses, about the anus, with escharotics, and why they even sometimes cut away considerable portions of flesh. It is true, hardness generally surrounds fistulæ in ano; but it is only such as accompanies every other description of abscess.

The dressings ought to be so small in quantity, as to allow nature to approximate the sides of the cavity together, and they should be quite unirritating.

By this simple treatment, the necessity of meddling with the rectum will often be removed. But, it more frequently happens, that the intestine, although not pierced by the matter, has yet been so denuded, that the sinus will not heal, without laying the cavity of the abscess, and that of the intestine, into one. According to Sir Astley Cooper, the difficulty of healing many abscesses near the rectum, depends upon their being influenced by the action of the sphincter and levator ani muscles, which have a constant tendency to prevent the union of the granulations and coalescence of the sinus.*

The operation consists in dividing the rectum, from the top of the hollow, in which the matter is lodged, as far as the anus. Thus the sinus is converted into an open wound. A narrow, curved, probe-pointed knife, is the proper instrument, and if it can be guided by the director, introduced through the track of the fistula, quite as far as the intestine, so much the better. The surgeon's fore-finger in the rectum will here feel the point of the knife. Then the director, if used, is to be withdrawn, and the operation is to be completed, by bringing the knife out, with its point applied to the finger, within the intestine. In this manner, all that is between the edge of the knife and the anus must obviously be divided.

Immediately after the operation, a soft dossil of fine lint should be introduced, from the rectum, between the lips of the incision. This first dressing should remain, till loosened by suppuration. All the future dressings should be light, soft, and unirritating. A T bandage is usually employed.

We have now to consider fistulæ in ano, in the state in which they are after having spontaneously burst.

When the matter has made its escape only through external openings, they are termed *blind external fistulæ*. Sir Astley Cooper has several times known a sinus form on each side of the anus, and communicate round the rectum. He examined the body of a man, who died of a discharge from a sinus in the groin, and who had a fistula in ano: the sinus passed under Poupart's ligament, took the course of the vas deferens, and descended into the fistula in ano. Sometimes, as the same practitioner observes, the sinus only just reaches the sphincter, and is extremely small, appearing at first only as a suppuration of one of the follicles of the anus. Sometimes, it reaches four inches up the side of the rectum.* When there is an opening in the intestine, and none in the skin, the fistula is called a *blind internal fistula.* Fistulæ, having an opening, both in the skin, and gut, are termed *complete.* The first and last cases are the most common. A probe is to be introduced to ascertain their nature, and the operation, already described, is the proper one for obtaining a cure. When there are several openings, and corresponding sinuses, they are all to be divided with a curved bistoury, so as to make one cavity of the whole.

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* Lectures, vol. ii. p. 325.

In cases of *blind internal fistulæ*, if the bursting and discharge of the matter should not produce a cure, which they sometimes do, though very seldom, an external opening is to be made, and then the same operation, as has been already described for other cases, is to be put in execution. The place for the opening is always sufficiently denoted by the induration.

When the sinuses become truly fistulous, in consequence of mismanagement, and their long existence, they should be freely opened, and dressed with simple unirritating applications. Sometimes, the health will yet require to be improved, before a cure can be accomplished, and many patients, who cannot recover in hospitals, do so on removing into a better air. Sir Astley Cooper says the medical treatment of the fistula in ano (meaning a particular form of it connected with visceral disease) consists in restoring the secretions of the liver, and intestinal tube, by submurias hydrargyri, or pil. hydrargyri at night, and the compound infusion of gentian, with soda and rhubarb, twice in the day.†

CHAP. LV.

LITHOTOMY.

A STONE in the bladder is usually attended with the following symptoms: frequent inclination to make water; acute pain in the glans penis and extremity of the urethra, relieved by pressure of the parts, and pinching and drawing the prepuce; a circumstance, explaining the elongated state of the foreskin often seen in children afflicted with this disorder. At the period when the last drops of urine are coming away, a violent spasmodic pain is felt in the bladder, owing to the stone being then grasped by it. Children, when suffering severely, cross their legs after expelling the urine, and press upon the organs of generation with considerable force.* When the patient is discharging his urine in the standing posture, the stream is apt to be suddenly stopped by the calculus falling towards the neck of the bladder, the stream continuing again directly he lies down on his back. The irritation is not confined to the bladder, and extremity of the urethra, but generally extends to the rectum, occasioning frequent desire to go to stool, tenesmus, and, very often in children, prolapsus ani. Frequently, when the stone is rough or pointed, or the patient takes exercise, bloody urine is voided, the bladder inflames, and very severe pain, with febrile symptoms, is experienced. As the disorder continues, the bladder becomes more and more irritable, and the urine generally has a white, slimy, gritty sediment. The fits of pain in the hypogastric region increase both in their severity and frequency. The bladder, being subjected to repeated inflammations, at length becomes enormously thickened, its natural dilatability being lost, and its cavity rendered very diminutive. In very bad cases, its mucous coat ulcerates. The kidneys are not unfrequently diseased; one being sometimes much enlarged, and the other wasted away. The ureters are often dilated, so as to form, as it were, pouches for the reception of the urine, which now can hardly be contained in the bladder at all. In the worst stage, the patients are much emaciated, and sometimes die of hectic complaints.

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* Lectures, vol. ii. pp. 326, 327.

† Vol. cit. p. 328.

An enlarged prostate gland is attended with symptoms resembling those of stone; but, with this difference, that the motion of a coach, or horse, does not increase the grievance, when the prostate is affected; while, in cases of stone, it does so in an intolerable degree. In the latter disorder, the paroxysms of pain come on at intervals, whereas the pain from a diseased prostate gland is neither so unequal, nor so acute.

Although the foregoing symptoms, particularly when they all occur, make it highly probable, that the bladder contains a stone, they cannot be depended upon. Patients have often been known to have a calculus in the bladder, without experiencing any remarkable inconvenience; while others, who apparently suffered the usual grievances of that complaint, were found in the end never to have had a stone, their afflictions having proceeded from quite another disease, as, for instance, a scirrhous induration of the bladder and neighbouring parts.†

Since, therefore, the symptoms of stone in the bladder bear a strong resemblance to those of various other diseases, no surgeon of ordinary prudence ever ventures to offer a decided opinion on the case, before he has introduced a metallic instrument into the cavity of that organ, and actually touched the stone itself. Neither will he affirm, that there is no stone, because he cannot feel it in his first examination. One of the most experienced surgeons that ever lived, says, "I have myself sounded, and not detected a stone at one time, which I have afterwards felt. I have sounded, and not discovered a stone, which another surgeon has afterwards perceived. I cut a patient, and extracted thirty-seven stones from his bladder, who had been sounded, and declared not to have a stone." *

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* Sir A. Cooper, Lectures, vol. ii. p. 228.

† Desault, Journal de Chirurgie, t. ii.

OF SOUNDING, OR SEARCHING FOR THE STONE.

The instrument, expressly calculated for this purpose, is denominated a sound, which is not hollow like a catheter, but solid, and made of the best steel. As a stone is generally carried by its own weight to the lowest part of the bladder, the sound is less curved, and somewhat longer, than a catheter, in order that it may reach behind and below the neck of that viscus. Being only a particular kind of probe, the chief use of which is to convey information through the medium of the organ of touch, its handle should be highly polished, so that as many points of it may be in contact with the fingers as possible.

The mode of introducing a sound is the same as that of passing a silver catheter; a subject, described in the chapter on retention of urine.

When its extremity is in the bladder, it is first to be inclined downwards, for the purpose of ascertaining whether the stone occupies its most frequent situation, beneath the convexity of the instrument. If the calculus cannot be felt in this direction, the end of the sound may be gently turned, first to one side and then the other; and, in the event of the calculus not being now touched, the handle of the instrument is to be depressed, and its extremity inclined upwards and forwards, in order to learn whether the foreign body may not lie more towards the fundus of the bladder. Frequently, the stone cannot be felt before the whole of the urine has been voided, and the bladder is contracted; and sometimes the sound cannot be made to strike the calculus, unless this body be first raised up by a finger passed into the rectum, in doing which, the surgeon may occasionally feel the stone, if it be large, through the intervening coats of the bowel and bladder. As, however, this method is seldom requisite, except when the calculus is smallish, the practitioner must not always expect to feel it with his finger through the bowel; nor is it a matter of any practical importance, because the information, thus obtained, is more liable to be fallacious, than what the sound affords, and, if the stone cannot be felt with this instrument, any kind of feel communicated to the finger within the rectum, would not warrant the making of an incision into the bladder.

When the stone is smallish, and lies on one side of the cervix of the bladder, it may not admit of being readily hit with the sound.

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* Sir Astley Cooper's Lectures, vol. ii. p. 248.

Also, when from repeated attacks of inflammation, hardened folds, or, from other causes, distinct cysts have been formed within the bladder, the calculus sometimes lies within a depression, or cavity, and cannot be felt with the instrument. Under such circumstances, before the sound is introduced, the patient should hold his water, until the bladder is quite full, and, if possible, until it is so distended as to efface, or diminish its preternatural excavations. Then the patient should stand up, and make water with his body inclined forwards, whereby the calculus will be carried towards the neck of the bladder, and admit of being struck with the instrument.* Whenever the surgeon cannot readily touch the stone, the patient is to be sounded in different attitudes.

In sounding, how possible it is to mistake a thickened, indurated bladder for a stone in that organ, may be well conceived, when it is considered, that Cheselden, with all his judgment and experience, actually cut no less than three patients, none of whom had any stone in the bladder at the time of the operation. On the other hand, the case of La Peyronie, exemplifies most convincingly the possibility of failing to discover a stone even of considerable size, though the sound be repeatedly passed.

There are two methods of treating calculous patients generally considered by writers; one is that of attempting to dissolve the stone, or, at least, palliate the symptoms, by medicines; the other aims at its removal from the bladder by a surgical operation. In women, the latter object may often be performed by dilating the meatus urinarius, without using any cutting instrument†; but, in the male sex, the great length, narrow diameter, winding course, and considerable irritability, of the urethra, make the extraction of calculi through it, and even the getting hold of them in the bladder with any instrument introduced through the passage, so difficult, that, except when the stone is small, and has been carried by the urine into the urethra, lithotomy has generally been deemed indispensably necessary. It is to be hoped, however, that the success which Sir Astley Cooper, Mr. Brodie, and others have had in extracting calculi from the bladder with the urethral forceps constructed by Mr. Weiss, and the efficiency, with which the lithontriptor of M. Civiale has been sometimes employed for reducing larger stones to small particles, capable of discharge with the urine, will make a due impression on every practitioner, desirous of lessening the frequency of one of the most painful and fatal operations in surgery.

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* Richter, Anfangsgr. b. vii. p. 103.

† Notwithstanding the many respectable advocates for this practice, it should be known, that there are some men of considerable eminence who object to it, as being more tedious and painful, and more likely to be followed by an incontinence of urine, than the use of a cutting instrument. Of this sentiment is the experienced Klein, who has tried both methods, and in 1816 had cut for the stone 79 patients. See Practische Ansichten der bedeutendsten Chirurgischen Operationen, auf eigene Erfahrungen gegründet von D. C. Klein, p. 21. 2tes Heft, 4to. Stuttgart, 1816.

Though the calculus may have been felt with a sound, at some period or another previously to the time fixed upon for the operation, it is an established maxim in surgery *never to perform lithotomy, unless the stone can be plainly struck with a sound, or staff, immediately before the operation.* A man may have a stone in the bladder to-day, and the surgeon may strike it so manifestly with the sound, as to make the circumstance perceptible to the ears of the by-standers, as well as to his own fingers; but to-morrow, the stone may protrude between the fasciculi of the muscular fibres of the bladder, carrying along with it a pouch, formed by the lining of this viscus, and, in this circumstance, the stone is no longer in the cavity of the bladder; consequently it can neither be felt by sounding, nor extracted by the operation of lithotomy.

OPERATION.

As one of the principal dangers of lithotomy is inflammation of the bladder and peritoneum, I think the common principles of surgery teach us, that it must be a matter of prudence to remove, if possible, before-hand, any state of the constitution, known to promote the access of inflammation. A low regimen, for a few days previously to the operation, and a dose or two of salts, are generally advisable. A plethoric subject might even be bled, if not before, at all events, immediately after the operation.* A few hours before the patient is cut, the rectum should be emptied with a clyster, as its distention would expose it to injury. Whether any good results from giving a dose of opium, a little while before the operation, I cannot say, as it is a practice which does not prevail in England. Klein speaks favourably of it, and says, he never omits it, either when lithotomy or any other considerable operation, is to be done. The patient wishes for the medicine himself; it lessens pain; and it facilitates the introduction of the sound.†

It is generally considered advantageous to let the bladder be somewhat distended with urine when the patient is cut, and hence, he is usually directed to avoid making water for an hour or two before the operation. This advice I consider well founded, particularly when a gorget is to be thrust into the bladder, which, in an empty state, must be more liable to be wounded at its posterior part; but, in operating with a knife, whether this organ contain urine or not, cannot be a matter of importance, unless the escape of the urine, when the instrument enters the bladder, is to be considered as useful information. Klein, who is in the habit of using a common scalpel, says, he never gives himself any concern about the bladder being empty or not.*

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* The objection to bleeding previously to lithotomy is, that the patient sometimes loses a considerable quantity of blood in the operation itself.

† Klein, Chirurgische Bemerkungen, p. 28.

The patient should be placed upon a flat surface, where it is much easier to introduce an instrument in the direction of the axis of the pelvis, than when the table slopes, the posture of the patient then making the operator liable to cut too low, and endanger the rectum. By laying the patient on a flat table, he is prevented from overlooking the operator, and terrifying himself with the sight of blood and instruments. When the patient is put on a sloping surface, the operator must kneel down to gain the advantages, which he fully has sitting down at his ease, before a table that has a straight even surface.† The table should be high enough to bring the perineum on a level with the surgeon's breast. The buttocks should be somewhat more raised than the abdomen; the patient lie upon pillows conveniently placed; and the nates project rather beyond the edge of the table. ‡

A staff is then to be introduced into the bladder. Two strong garters or ligatures, each about two yards long, are then to be doubled, and placed by means of a noose round the patient's wrists, who is next to take hold of the outside of his feet with his hands, the fingers being applied to the soles. The two ends of the ligature are then to be carried in opposite directions round the ankle, over the back of the hand, and under the foot, when they may be tied in a bow. The hands and feet being thus securely connected together, the knees and feet are to be supported, kept steady, and held apart by the assistants. Binding the patient in the foregoing way is rather an uncouth proceeding; but, as much danger would result from the patient's moving about in particular stages of the operation, all the most experienced surgeons deem it a matter of necessity.

In arranging the posture of the patient, the chief objects to be attended to are, first, to let the buttocks be exactly even; to take care that neither of the assistants draw the thighs too much towards his own side; and that the parts, situated between the raphe of the perineum and the ascending ramus of the ischium, be stretched, in which condition, the requisite incisions can be performed with more facility. §

The staff should be introduced before the patient's hands and feet are bound together; first, because, if the calculus cannot be felt with this instrument, (which being now used for the sound saves the patient the pain of a double introduction through the urethra,) it will not be necessary to tie up the patient at all, as the operation must not be attempted; secondly, because, while the patient is unbound, the instrument is more easy of introduction, and in searching for the stone, a change of posture is often necessary.

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* See Klein's Chirurgische Bemerkungen, p. 26.

† Ibid. p. 23.

‡ C. J. M. Langenbeck über eine einfache und sichere Methode des Steinschnittes mit einer Vorrede von Dr. J. B. Siebold, p. 44. Wurzburg, 1802.

§ Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c. p. 12.

A curved director, the groove of which serves to guide a cutting instrument into the bladder, is an exact definition of a staff. It is shaped like a sound, or catheter, so that it may pass through the whole of the urethra; but it is frequently rather more curved than those instruments. Its handle, instead of being smooth, like that of a sound, is generally rough, in order that it may be held with greater steadiness. Two advantages are generally supposed to arise from its extremity being more curved than the end of a sound, or common silver catheter; viz. its convexity is more plainly distinguishable in the perineum; and by depressing the handle of the instrument, when the gorget is to be pushed along its groove, the latter part can be more readily made to take a course corresponding to the axis of the pelvis. A staff should be long, because the greatest mischief would happen if the instrument were not to extend fairly into the bladder, at the moment of employing the gorget. The termination of the groove should always be closed; for, I presume, no lithotomist, whatever may be his kind of gorget, can ever intend its beak, when passed to the furthest degree, to quit the groove of the staff.

The groove should always be deep and broad; and the instrument be of largish diameter; for, the wider it is, the more easily it can be felt in the perineum, the more distended the membranous part of the urethra becomes, and the more regular the incision in it is likely to be made.

Though a staff should be more curved than a sound, it need not be immoderately bent, for the sake of rendering its convexity very prominent in the perineum, because the bones are a sufficient guide to the right place of the first incision. A staff, says Langenbeck, which is much bent, is difficult to introduce; while one less curved, may always be felt plainly enough in the perineum.* That the instrument is fairly in the bladder, may be known by its handle sinking towards the ground, without the least impediment.

In the first stage of the operation, the staff is to be held by an assistant, who also raises the scrotum with his left hand, so that the surgeon may have a complete view of the perineum. Some operators are anxious, that the convexity of the instrument should project distinctly in the perineum, for which purpose the assistant is usually desired to hold the handle perpendicularly to the patient's trunk, and to propel the whole staff gently towards the part, where the first incision is to be made into it. The generality of surgeons, who attach much importance to this projection of the convexity of the staff in the perineum, direct the instrument to be held straight, that is to say, with the handle neither inclined to the right, nor left. Other operators, however, take a different mode of determining the situation for the first incision, as will be hereafter explained, and prefer fixing the position of the staff, not with any view of making it project in the perineum, but on the following principles, supposing the operation is to be completed with a scalpel.

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* Über eine einfache und sichere Methode des Steinschnittes, &c. p. 42.

1. After the membranous portion of the urethra has been opened, the incision should be made laterally through the prostate gland.

2. The vesiculæ seminales should be avoided.

3. The rectum is closely attached to the prostate gland, by means of cellular substance.

When these things are considered, says Langenbeck, it must be evident how much will depend upon the position of the staff, and a right judgment may be formed of the manner in which it ought to be held.

1. The handle should be inclined towards the patient's right thigh; a method preferred by Cheselden.

2. At the same time, the assistant ought to turn forwards that edge of the handle, which faced the left thigh. By this manœuvre, the end of the instrument in the bladder will be turned sideways and a little downwards, and there will not be the least risk of wounding either the caput gallinaginis, the vas deferens, the vesiculæ seminales, or the rectum.

3. Lastly; the handle of the staff must be depressed towards the ground, whereby its end will be removed farther from the prostate and neck of the bladder more deeply into the latter viscus. If the operation is to be completed with a knife, the staff, when put in the foregoing position, is to be committed to the charge of the assistant, who is to hold it so during the rest of the proceedings.* The difference of Cheselden's mode of holding the staff from Langenbeck's plan was, that the former did not turn the groove so completely to the left as the latter, while the concavity was drawn up close to the os pubis, in order to remove the urethra as far as possible from the rectum. No doubt, Langenbeck's directions are excellent, when the incisions are to be done altogether with a knife; or until the surgeon takes the gorget in his hand. But when the latter instrument is to be introduced with its edge directed obliquely downwards and outwards to the mid-point between the tuberosity of the left ischium and the anus, the beak will certainly pass more securely if the groove of the staff be rather inclined to the right side of the perineum by moving its handle at the moment a little towards the left groin, as used to be the custom of Desault.† The common plan of holding the staff quite straight, with its handle perpendicular to the patient's body, and its convexity prominent in the perineum, may be considered unobjectionable, while the surgeon is making the external incisions, and until he proceeds to lay open the

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* Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c. p. 47.

† "L'inclinaison légère du cathéter à gauche, à l'instant de l'introduction du gorgeret, donne au chirurgien la facilité de diriger la lame de celui-ci de telle manière, qu'elle se trouve exactement parallèle à l'incision extérieure." See Œuvres Chir. de Desault; tom. ii. p. 469.

membranous part of the urethra. When this is to be done, the groove of the staff should be turned a little to the left side of the perineum; and, afterwards, when the prostate gland and neck of the bladder are to be cut with the gorget downwards and outwards, it will unquestionably be safest to incline the handle of the staff a little towards the left groin, while it is also brought forwards. At this period, the staff must be held by the operator himself; for otherwise he loses the advantage of feeling in the best way whether the two instruments are properly in contact—whether the beak of the gorget is passing securely within the groove of the staff. In completing the operation with a knife, however, I believe with Langenbeck, that the assistant ought to hold the staff the whole time, because there is no perilous thrust of the gorget to be encountered, and when once the staff is well placed, the division of the parts can then be most conveniently performed under the guidance of the groove of that instrument, the index-finger of the surgeon's left hand, his own eyes, and his own anatomical knowledge.

The position of the staff having been arranged according as the intention may be to employ a gorget, or not, the surgeon is to sit down in a low chair, and proceed as follows:

1. He is to feel for the arch of the pubes.

2. He is to trace with his finger the descending ramus of the pubes, the ascending ramus, and the tuberosity of the ischium.

3. When he has plainly distinguished these parts, he is to fancy to himself a line, beginning one inch below the arch of the pubes, running down at the distance of a finger-breadth from the rami of the pubes and ischium, and terminating between the anus and tuberosity of the last-mentioned bone. On this line, the surgeon is to make the first incision through the integuments with one sweep of the knife, while doing which, he is to place the fingers of his left hand on the right side of the nates, and make the skin of the perineum tense with the thumb. *

In a boy eight years of age, Langenbeck begins the incision one finger-breadth above the anus, and half a finger-breadth from the ascending ramus of the ischium. In an adult, he recommends the cut to begin two finger-breadths above the anus, and to be carried down at half that distance from the ramus of the ischium. † As far as my own judgment extends, the beginning of the incision in a full-grown person should never be more than an inch and a half at most above the anus, as laying open a greater extent of the membranous part of the urethra towards the bulb, can have no more effect in facilitating the extraction of a stone from the bladder, than if the whole urethra were divided. When the external incision is made too high up, considerable disadvantage arises; for, when the operator begins in this way, and extends the wound the usual

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* Langenbeck, vol. cit. p. 49.

† See his Neue Bibliothek für die Chirurgie und Ophthalmologie, b. i. p. 437. 12mo. Hannover, 1818.

length, and divides with his scalpel the fat, transversales muscles, ligamentous fibres, and membranous part of the urethra, and then with his gorget makes the division of the prostate gland and neck of the bladder, he finds, upon attempting to take out the stone, that the external part of the wound is too high up, in regard to the opening in the bladder, and the same impediment to the extraction of the calculus is produced, as if the wound were too small. A free and direct opening for the passage of the stone ought always to be made; the fatal termination of numerous cases being entirely owing to the neglect of this important rule; because when the wound is too small, the greatest difficulty is experienced in getting out the stone, the forceps are introduced again and again, the bladder is seriously bruised and injured, the patient is kept a long time upon the operating table, and, if a further use of the knife be not made, or the stone broken (a very unpleasant circumstance), the extraction either will not be accomplished at all, or not without violent laceration of parts, which ought to be simply divided.

Having made the necessary division of the integuments, the next object is to dissect through the fat and cellular membrane, cut through the transversales perinæi muscles, and make an opening through the membranous part of the urethra, into the groove of the staff.

In this stage of the operation, the groove of the staff ought to be turned towards the left side of the perineum, downwards and outwards, and perhaps even somewhat more laterally, when it is intended to complete the opening into the bladder altogether with a knife. The principal things here to be avoided, are, cutting the bulb of the urethra, endangering the arteria profunda penis, and opening the membranous part of that canal too high up. Of course, before the surgeon ventures to cut into the groove of the staff, he ought to feel the edges of the instrument very distinctly with his left fore-finger. It is also safest to begin to lay open the membranous part of the urethra at what may be regarded as the anterior point of the opening out of which the stone is to pass, and not further back, towards the prostate gland. As soon as a small incision has been made into the groove of the staff, with the edge of the knife turned upwards and inwards, the operator, guided by the groove and his left fore-finger, is to extend the cut back, as far as the prostate gland, through the rest of the membranous part of the urethra, taking care to keep the edge of the scalpel always turned in the same direction, upwards and inwards towards the groove of the staff.

Some operators place the back of the extremity of the knife in the groove of the staff, and then lay open the urethra as far as the prostate, with the edge directed downwards and outwards. Either of these methods is perfectly safe, provided the staff be sufficiently large, and its groove wide and deep. However, in dissecting down to the membranous part of the urethra, and in laying it open, as well as in cutting deeply towards the prostate, the surgeon must never direct the edge of the knife too much downwards, because he would wound the lower part of the rectum; and the same caution is still more necessary in dividing the prostate gland.

When the preceding instructions are duly fulfilled, very little remains to be done with the gorget.

Every operator should be particularly careful, that the beak of the gorget is accurately adapted to the groove of the staff. As far as my humble judgment extends, the edge of a gorget ought not to turn upwards, as advised by Mr. Abernethy and Scarpa.* By cutting in this direction, the pudendal artery must be more apt to be wounded than when the incision is directed outwards and downwards, towards the mid-point between the anus and the tuberosity of the ischium; because the rami of the ischium, on the inside of which the common pudendal arteries run, converge as they ascend; and, for the same reason, by using a gorget with an edge turned upwards, the wound can hardly be made large enough for the extraction of stones of considerable size. The impossibility also of making, with such an instrument, the incision in the neck of the bladder and prostate gland in the same direction as the oblique external wound, is another weighty objection to it. As Langenbeck correctly remarks, it is difficult to conceive how the pudendal artery can ever escape, when Cline's gorget is employed, the edge of which cuts directly towards that vessel. Fortunately, says he, the artery lies very close to the bone, and under an aponeurosis.† The direction of the edge of the gorget upwards and outwards must be still worse.

When a gorget is made to cut outwards and downwards, in the manner above recommended, a longer cutting edge can be employed, without any risk of wounding the pudendal artery, so that a sufficient opening may be made in the bladder, for the easy passage of the stone, and one of the principal objections to gorgets in general is materially lessened.

Having made a free opening into the urethra, as low down as can be conveniently done, the operator is to place the beak of the gorget in the groove of the staff, and, being sure that this is accomplished, he is to take hold of the handle of the latter instrument with his left hand, while with his right, he holds the beak of the gorget carefully applied to the groove of the staff, along which it is to glide into the bladder. But, before pushing the gorget onward, a most important rule is to be observed; namely, to bring the handle of the staff considerably more forwards, than a perpendicular line to the trunk, and thus to elevate its extremity, by which means the gorget may be introduced, along the groove, nearly in the direction of the axis of the bladder. In fact, it should be introduced, as nearly as the curvature of the staff will admit, in the direction of a line drawn from the os coccygis to the umbilicus, its beak being most carefully kept in the groove. When this plan is followed, it will never wound the rectum, nor insinuate itself into the cellular substance between this intestine and the bladder.

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* See his Memoir on Hawkins's Gorget, translated by Briggs.

† Über eine einfache und sichere Methode des Steinschnittes, p. 67. Klein wounded the pudendal artery, by using Cline's gorget. See Chirurgische Bemerkungen, p. 15.

When the gorget has entered the bladder, a circumstance indicated by the discharge of urine from the wound, the staff is to be withdrawn, and a proper pair of forceps passed along the gorget into the bladder, for the purpose of seizing and extracting the stone. Formerly, the forceps used to be made too thick and clumsy, the inside of the blades being frequently furnished with little spikes or teeth, intended to keep the stone from slipping. These were exceedingly objectionable; first, because they often broke the calculus before it was out of the bladder; and, secondly, because those situated towards the back part of the blades, when the stone happened to be grasped there, had the effect of increasing the expansion of the instrument so considerably, that it could not be drawn out.* The teeth of common stone forceps have also an ill effect in preventing the stone, when it is grasped with its long axis across to the wound, from turning, as the forceps are drawn out, into a better position. However, though teeth are not to be commended, the inside of the blades ought to be somewhat rough.

The surgeon should always be provided with several pairs of forceps, of different sizes. The handles should be two-thirds of their length, and the blades one-third. Some of the blades must be flat, for the extraction of small calculi, or fragments; while the blades of others should be curved, to reach calculi behind the pubes or prostate gland.†

While the operator is passing the forceps along the gorget, the latter instrument must be kept quite motionless, lest its sharp edge do mischief; and immediately the forceps is in the bladder, the cutting gorget is to be withdrawn.

The next object is to take hold of the stone with the forceps. The operator should not expand the instrument as soon as it has arrived in the bladder; but he should first make use of it as a kind of probe, for ascertaining the exact situation of the stone. If this be lodged at the lower part of the bladder, just behind its neck, and be distinctly felt below the blades of the forceps, the forceps may be opened immediately over the stone, and after the blades have been depressed a little, they are to be shut. Certainly, it is much more scientific to imitate Cheselden, and use the forceps, at first, merely to ascertain the position of the stone; for, when this is known, the operator is far more able to grasp the extraneous body, in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut. No man can doubt, that the injury which the bladder frequently suffers, from reiterated and awkward movements of the forceps, is not an uncommon cause of a fatal inflammation of this organ, and of the peritoneum.

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* Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 45.

† Sir A. Cooper's Lectures, vol. ii. p. 255.

If the calculus cannot be readily felt, the forceps should not be roughly moved about, so as to bruise the bladder, and put the patient to insufferable agony; but it should be taken out, and the fore-finger gently introduced, with which the situation of the calculus may generally be distinctly felt.

When the situation of the calculus has been ascertained, the blades of the forceps are to be separated, and the stone received between them: this must be done with great gentleness. If the extraction be violently resisted, the stone should be quitted, the forceps withdrawn, the position of the stone examined with the finger, and, if necessary, its long axis made to correspond to that of the bladder. Stones are often broken, which might be removed whole, if the surgeon were less violent, and more cautious. The mode of preventing them from being broken, is, after they have been taken hold of, to put the thumb, or finger, between the handles, so as to hinder them from being forcibly closed.*

When the stone is so large, that, turned in any position, it cannot be extracted from the wound without violence and laceration, the surgeon may either break the stone with Mr. Earle's instrument, or with a strong pair of screw forceps, furnished with teeth for the purpose; or he may enlarge the wound with a common scalpel, or a probe-pointed curved bistoury, introduced under the guidance of the fore-finger of the left-hand.

To the employment of the knife in this circumstance, I must express my decided preference; because breaking the stone creates a disagreeable risk of fragments being left behind, and, consequently, of a return of the disorder.

When the stone, however, exceeds certain dimensions, the operator ought rather to break it, than employ unwarrantable force for its extraction.†

When this has been done, and as many of the broken pieces have been taken out with small forceps as can be thus removed, the surgeon is to feel with his finger, whether any fragments still remain. If they do so, gentle attempts must be made to extract them with the scoop. Lukewarm water is sometimes injected, with the view of washing them out; but, I believe, Sir Astley

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* Sir A. Cooper's Lectures, vol. ii. pp. 254—262.

† When a stone is of enormous size, and evidently cannot be sufficiently broken, without too tedious and irritating a process, I think the high operation should be preferred, because, above the os pubis there is much more room for the extraction of a very large calculus, than under the arch of that bone. Let not the inexperienced practitioner fancy, however, that any calculus can be got out above the pubes; for stones have sometimes been so enormously large as to fill the bladder, and not to admit of being taken out, even from the dead subject, without vast difficulty and violence.

Cooper is right in representing the proceeding as one of little utility.*

The operator ought always to examine a stone, as soon as it is extracted; if it be rough, it is a presumptive sign, that it is the only one; if smooth on one side, and rough on the other, or excavated at any surface, there may probably be other stones. But, in every instance, the fore-finger should be introduced, to obtain decisive information on this point; for, it would be unpardonable to put the patient to bed, while another stone remains.

Sometimes, a stone cannot be grasped with the forceps, unless it be first raised by the left fore-finger, introduced within the rectum.

OF COMPLETING THE INCISION INTO THE BLADDER WITH A KNIFE INSTEAD OF A GORGET.

The disastrous accidents, which occasionally result from the employment of gorgets, have induced many judicious surgeons to prefer finishing the operation with a knife, or, at all events, some kind of cutting instrument, not suddenly thrust into the bladder, like a common gorget, with a risk of slipping away from the staff, and doing the most fatal mischief. From mistakes and unskilfulness in this part of the operation, I have known the urethra to be entirely severed from the bladder, and the patient, after suffering excruciating torture upon the operating table, die from the injury done, with the stone unextracted, the bladder not having even been opened. In several examples, I have known the gorget slip between the bladder and rectum, and the patients lose their lives with the stone unremoved. I have seen patients opened after this operation, in whom the gorget had dreadfully injured the opposite side of the bladder. I recollect other cases, in which the gorget slipped between the bladder and pubes, and, of course, the calculus never had an opening made for its extraction. In one, or two cases, I have known the rectum to be cut, more than the bladder itself. Now, when it is further considered, that besides such mischief, arising from the slipping or unskilful use of a well-made gorget, a broad, badly constructed one may cut the pudendal artery, it must be confessed, that there is great cause for wishing that lithotomy could always be done with an instrument attended with fewer dangers.

According to Klein, than whom few have written more sensibly on lithotomy, that method of operating must be accounted the most advantageous, in which the surgeon is best enabled to make with certainty the right kind of incision, that is to say, in which the opening in the bladder may be made larger, or smaller, as may be judged requisite; in which also the fewest instruments are needed; the least irritation produced; the operation most expeditiously done; and in which the instruments will serve for every age and sex, and for all cases, whether the stone be large or small. A common scalpel is the only instrument possessing such recommendations, and with it, the operation can be perfectly executed. Unfortunately, however, instead of laudable endeavours to bring the knife more generally into use, we see every now and then new gorgets invented, as if these thoroughly useless instruments were really necessary.

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* Lectures, vol. ii. p. 262.

The gorget, says Klein, as a conductor for the forceps, is entirely unnecessary; for, how repeatedly do we see the latter instrument introduced in the course of an operation, under the guidance of the finger, without any assistance from a gorget? And, as the latter means is sometimes dispensed with, as a conductor, why should it not always be so? But, as a cutting instrument, it is not only not essential, but decidedly objectionable; for, in every instance, it makes the wound of a determinate size, whatever be the dimensions of the stone.

From the explanation already given of lithotomy with a gorget, the reader will understand how to proceed as far as the period, when the side of the prostate gland and the neck of the bladder are the only parts remaining to be divided; for, until this moment, every thing is done nearly in the same way, whether a gorget is to be afterwards employed, or not.

Cheselden, after cutting the fat rather deeply, especially near the rectum, used to put his left fore-finger into the wound, and keep it there till the internal incision was quite finished; first, to direct the point of his knife into the groove of the staff, which he now felt with the end of his finger; and, secondly, to hold down the rectum, and keep it from being wounded. The internal incision was then made by cutting into the groove of the staff, through the side of the bladder, immediately above the prostate, and afterwards continuing the point of the knife along the same groove downwards and forwards, so as to divide the portion of the sphincter lying upon the prostate, and then the outside of the gland itself obliquely, in the direction of the urethra within it, the requisite division of which, however, was made the last part of the business.

Mr. C. Bell imitates one of Cheselden's earliest methods; cutting first into the staff, and then running the knife along the groove of the staff, into the bladder, followed by the left fore-finger. This is to remain, the knife to be withdrawn, and the forceps introduced under the direction of the finger. The chief peculiarity in the method, is the use of a staff, grooved on the right side.*

Klein considers it immaterial, whether the groove of the staff be turned obliquely downwards, or to the left: as far as his own experience goes, the knife is less apt to slip when the groove is downwards, which may then be more readily found.

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* See C. Bell's Operative Surgery, vol. i.

Klein has given the most exact account, which I have been able to find, of the method of operating with a knife. The following are the instructions delivered by him: —

After the rectum has been emptied with a clyster, a dose of opium administered, the patient properly bound upon the table, and the hair shaven off the perineum, the staff is to be introduced. The scrotum is to be held up by an assistant, who is to hold the convexity of the staff obliquely towards the left side, and closely pressed against the perineum.

The operator should be seated, with his breast on a level with the patient's perineum: he is to notice well the direction of the ascending ramus of the ischium; stretch the perineum towards the right side with his left hand, and with a longish, convex-edged scalpel, he is to make an incision, three inches long, through the skin and muscles. This cut is to extend from the middle of the perineum, obliquely towards the left side, between the anus and ischium, running parallel to the ramus of the latter bone, at the distance of one finger-breadth from it. With his left fore-finger, the surgeon is now to feel for the groove of the staff, and cut completely through the muscles towards it, making the wound in the same direction as the first incision. He is to cut obliquely upwards towards the symphysis of the pubes; not in the middle of the external wound, but at its upper angle. By this second cut, he will either get into the groove of the staff, or, at all events, be enabled to feel it very plainly, in which case, the point of the knife, guided by the finger, is now to be pushed into the groove, directly behind the symphysis of the pubes *, through the left side of the urethra, and the knife is then to be carried a little way forwards along the groove, in order to divide some of the membranous part of the urethra. By cutting precisely in this manner, it will be impossible to wound either the rectum, or the bulb of the urethra: the first part never, because the incision is directed upwards, not downwards; and with regard to the last, it is not at all endangered, as it is situated exactly under the symphisis of the pubes, and anterior to the incision in the urethra. Besides, it may always be pressed with the finger to one side.†

The knife being placed in the groove of the staff, the surgeon is to take the latter instrument from the assistant, incline its handle

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* Klein cuts higher up than Langenbeck directs, or than appears to me advantageous. How far the highest part of the incision ought to be below the arch of the pubes, I have explained in a foregoing page.

† Klein thought an injury of the bulb of the urethra a matter of no importance, and in itself I believe it is so; but, by cutting so high up as to expose it at all to be wounded, is disadvantageous on other accounts. First, because the external wound is then too high up, in relation to the opening, through which the calculus must pass out of the bladder. Secondly, because laying open all the membranous parts of the urethra is completely unnecessary. And, lastly, because cutting about the bulb, as Langenbeck has correctly pointed out, endangers the arteria profunda penis.

somewhat towards himself, so as to elevate its point, while he presses its concavity close up against the ossa pubis, partly to increase the tension of the urethra, and partly to let the instrument rest upon a fixed point, the groove still continuing to be directed to the left side.

Now the knife is to divide the membranous part of the urethra, and the prostate gland; which is the part of the operation requiring the greatest care. *In every case*, says Klein, *the blade must be so directed as to bring its surface in a parallel line to the ascending ramus of the ischium, with the edge towards the lower angle of the external wound, and never towards the ischium.* It is next to be considered whether, on account of the magnitude of the stone, or the patient's age, the incision should be large or small. In the latter case, the back of the scalpel must be kept close in the groove of the staff; but, in the former, it must be more or less separated from the groove, according to the extent to be given to the incision. The distance can only be well calculated by practice; but, a failure will never attend even the first trial; for, when any uncertainty prevails, it is always best to keep the back of the knife nearer the groove, and make a smaller cut, which, if necessary, may afterwards be enlarged.

Until now the knife is to be held like a pen, and the cut through the prostate gland might be performed in the same manner; but as its division requires more force than the parts previously cut, Klein thinks it better to grasp the handle of the knife with the whole hand. The scalpel being now securely held in the right direction, and the staff firmly kept in the proper position with the left hand, the first instrument is to be boldly and quickly carried straight along the groove of the latter. The point of the knife, which is never to quit the groove, is to be pushed on, either until it touches the closed part of the staff, or the want of resistance denotes its being within the bladder. When raising the handle of the knife in withdrawing it, Klein always takes that opportunity of dilating the incision in the bladder from within outwards, and the whole wound now has, instead of a triangular, a quadrangular form. "I thus (says he) combine the effect of a gorget with that of the bistoire caché. I open the bladder, as the knife is pushed on, and enlarge the opening as the instrument is withdrawn." *

The knife and staff having been withdrawn, the left fore-finger is to be introduced into the bladder, in order to feel whether the opening is large enough; *and it should always be large enough to let the stone easily pass out, without any violent pulling, which must inevitably occasion a serious degree of contusion.* The more readily the stone comes out, the more speedy is the cure. Le Cat, and Scarpa †, have written about the advantages of a small incision, the dangers of a free opening, and the little harm of dilatation. But, says Klein, "I entertain quite the opposite opinion, and consider a free incision as most likely to bring about an expeditious and a perfect cure." By following the above directions, the incision will never be made too large. Neither will the pudendal artery, nor any other part which ought to be avoided, be injured, as the edge of the knife never cuts towards the ischium, but at a certain distance from, and in a parallel line to it.

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* Practische Ansichten der bedeutendsten Chirurgischen Operationen auf eigene Erfahrungen gegründet von D. C. Klein, p. 23. 4to. Stuttgart, 1816.

† Memoir on Hawkins's Cutting Gorget.

Should the wound be found large enough for the extraction of the stone, the forceps is to be introduced under the guidance of the finger, and the calculus taken out.

But, if the opening appear too small, (a circumstance often first observable on attempting to draw out the stone,) the left fore-finger is to be passed into the bladder, and (under its direction, and with the point not projecting beyond it) the knife is to be again carried into the bladder, in its former position. The prostate gland is then to be completely divided, care being taken always to cut obliquely downwards to the left. If requisite, the incision is also to be carried on through a part of the bladder itself, in doing which, the operator must cut only with the further part of the knife, pressed on with the finger. Thus, the incision may be made as large as necessary, without any risk, and the rectum can never be hurt with the flat surface of the blade.

In a work of more recent date, Klein lays down, as the basis of his method, the necessity of always dividing not only the prostate gland completely through, but also a portion of the bladder itself. Upon this basis, (says he,) rests the success of my operations, and hence I invariably make it a rule, rather to make the incision too large, than too small, and never to dilate it with any blunt instrument, when it happens to be too diminutive, but to enlarge it with a knife, introduced, if necessary, several times.*

The next thing is to search for the stone with the forceps, the blades of which are to be oiled, and introduced into the bladder in the axis of the pelvis. Klein says, he has often got in the forceps, without any preliminary introduction of the finger. The instrument should be passed in the direction of the wound, with its sides turned towards the angles of the incision. The stone is now to be felt for, the position of which has in general been already ascertained by the finger, and it is commonly soon discovered, when the forceps is cautiously moved about in various directions. An endeavour is to be made to extract it by the smallest diameter, in regulating which object the fore-finger will be of assistance. The extraction should be done very slowly, and always in the direction downwards, outwards, and forwards, according to the axis of the wound. The stone should also be drawn out with a wriggling motion, between the lips of the wound, and not towards its angles, where the parts are less yielding, and an unnecessary degree of contusion would be produced.

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* Practische Ansichten der bedeutendsten Chirurgischen Operationen, p. 27.

In general, says Klein, when the wound is properly made, the stone may be taken out with great facility. If very large stones be met with, much turning of them, and a great deal of trouble, are sometimes necessary.

Another motive, judiciously urged by Klein, for making a free opening, is to extract soft stones unbroken, which is much better, than taking them out piecemeal, and repeatedly introducing instruments. He owns, that it is generally difficult to ascertain beforehand the soft consistence of a stone; yet, says he, when much sand-like matter is discharged with the urine, and the stone, when hit with a metallic instrument, makes no very distinct sound, a suspicion of its softness may be entertained, and, in this case, it is most prudent not only to make a large opening, but to avoid grasping the calculus too firmly with the forceps.

However, if the stone break, the largest fragments must be taken away partly with the finger, partly with the forceps or scoop, and partly by means of a lukewarm injection. The removal of every small particle, however, Klein considers unnecessary, as it is sure of being voided with the urine in the course of the first few days after the operation, and the repeated introduction of instruments would cause excessive irritation.

As soon as the calculi and fragments have been removed, a point, which is to be ascertained with the finger, the patient is to be unbound. Klein lays lint dipped in oil upon the wound, and then a compress, and T bandage. In this country, frequently, no dressings are applied to the wound directly after the operation; but merely a folded napkin, or sheet, is placed under the nates, and changed whenever it becomes wet.* Klein confines the knees loosely together with a napkin, and the patient lies upon his side with the thighs and knees considerably bent. Nor does Sir Astley Cooper consider it necessary to keep the patient always on his back, but says, the patient will derive great relief from lying sometimes on his side. The scrotum, he observes, should always be supported with a bandage, so as to hinder it from being irritated by the urine.† The first day, Klein lets his patient drink freely of barley-water, and afterwards of lemonade. Sir Astley Cooper also gives his patients at first large quantities of linseed tea, or barley-water, with gum acacia in it; and when the danger of inflammation is over, beef-tea, broth, or gruel. Klein gives an opiate, as soon as the patient is put to bed; and on the second day, the bowels are opened with a clyster, or gentle purgative. Sir Astley Cooper sanctions the exhibition of opium, if the patient be very irritable; but, unless absolutely necessary, dispenses with it, as it is apt to check the action of the bowels. When the wound suppurates, Klein dresses it with dry lint, and never finds any other application requisite, except sometimes a little caustic towards the end of the case.* In proof of the success of his method, he tells us, that in 1816 he had cut into the bladder seventy-nine times, and not one patient had died, unless where the prostate, bladder, kidneys, or ureters, were diseased. Notwithstanding the free division of the bladder, most of the patients got well in from eight to fourteen days; a few in a month; and one alone was three months in recovering. Though the sphincter of the bladder was divided, no paralysis of it was the result. Except when the calculi were large, or something unusual happened, the operation was completed in thirty seconds, or a minute.† When the wound begins to granulate, Sir Astley Cooper ties the legs together: if this be done too soon after the operation, he says, it hinders the free escape of blood and urine from the wound.‡

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* Sir A. Cooper's Lectures, vol. ii. p. 269.

† Vol. cit. pp. 268—270.

OF LANGENBECK'S LITHOTOMY KNIFE.

Langenbeck adopts many of Klein's sentiments concerning the principles of this operation; but he differs on one point, which is of consequence. He is of opinion, that the wound should be made at once of an adequate size; and not be made at first small, and afterwards enlarged, according to the size of the stone. While Klein thinks almost any scalpel will serve for making an opening into the bladder, and uses himself only a common bistoury, about seven inches in length, Langenbeck prefers a larger and broader knife, the point of which admits of having a sliding guard pushed over it, at the period when it is to be introduced along the groove of the staff. He thinks the edge ought to be convex; for if the knife be straight, the incision, if made from without inwards, will be too small; or, this inconvenience can only be in some measure hindered by making the lithotomy knife form a considerable angle with the staff; that is to say, by letting merely the point of the knife touch the latter instrument, while its back is considerably separated. When the angle between the staff and the knife is great, the broad part of the blade, Langenbeck conceives, is carried too near the pudendal artery A convex-edged knife always forms a larger incision, without any occasion for making so considerable an angle.

In cutting into the groove of the staff, Langenbeck opens the membranous part of the urethra at some distance behind the bulb: he does not cut straight forwards, or inwards with respect to the patient; but depresses the handle of the knife, and directs the

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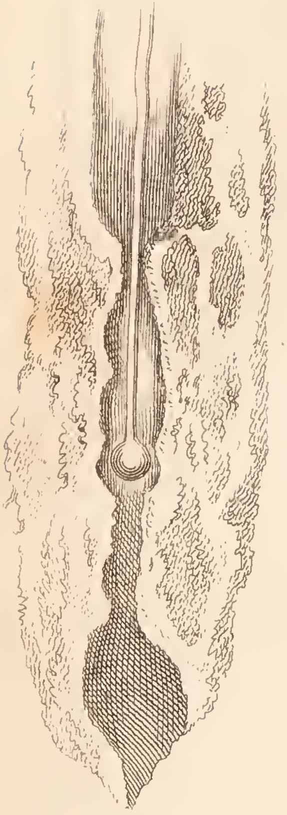
* Chirurgische Bemerkungen, pp. 37—48.

† Practische Ansichten der bedeutendsten Operationen, pp. 28, 29.

‡ Lectures, vol. ii. p. 269.

Fig. 1.



Mr. C. Bell's balls for examining Strictures.

Fig. 2.

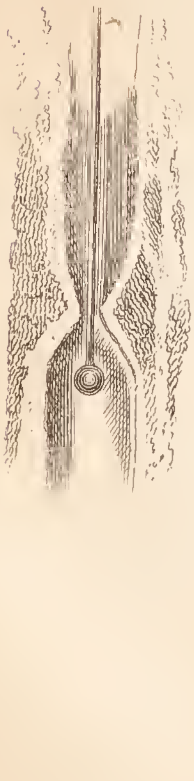


Fig. 3

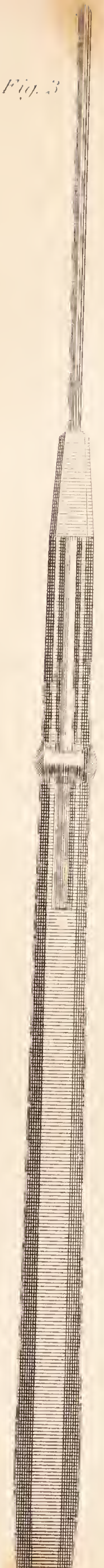


Fig. 4.

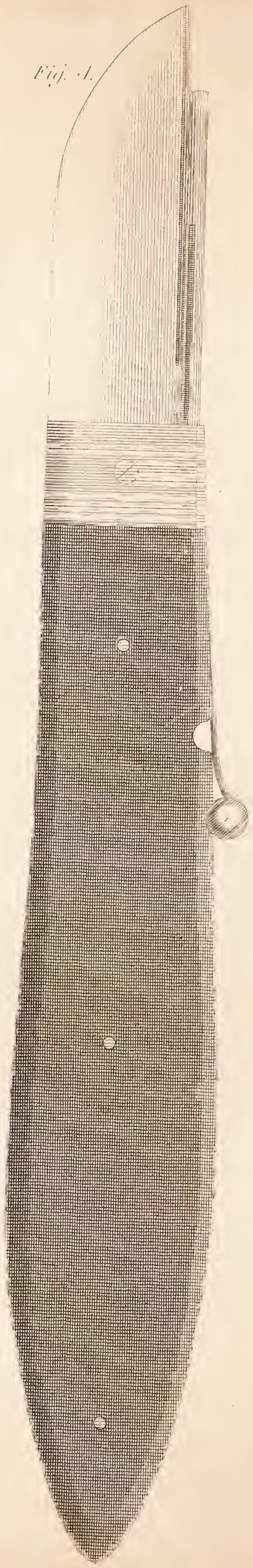
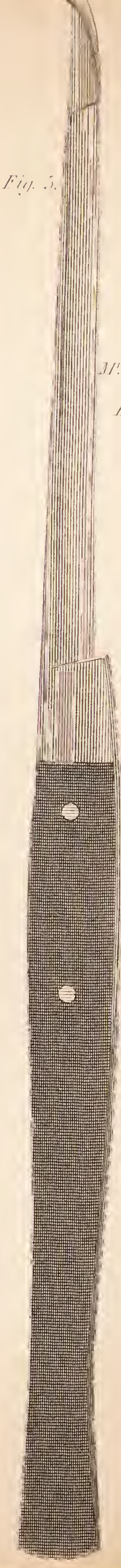
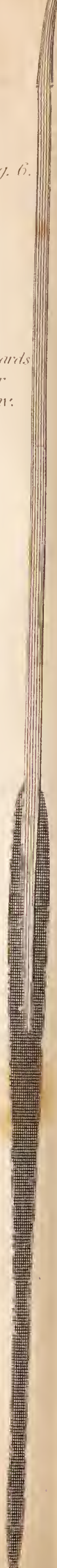


Fig. 5.



Mr. Thos. Blizards Knife for Lithotomy.

Fig. 6.



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point obliquely upwards towards the axis of the pubes. How necessary here a good point is for this manœuvre must be sufficiently obvious; for, the operator cannot go on with the incision, until he has first made a puncture.

Hence, Langenbeck's lithotomy knife is constructed with a sliding guard for the point. The guard, he says, is of essential use in facilitating the conveyance of the knife along the groove of the staff, because, if an attempt be made to push the knife forwards on its point, it will pass along with great difficulty, as the point will hitch in the groove. This will happen in the greatest degree, when the staff has been used in several previous operations. But, a lithotomy knife, the point of which is guarded by a small button, slips very readily along the groove.

Langenbeck considers the sliding guard * the more essential, as the knife must be pressed firmly into the groove of the staff; and, without such a contrivance, its point would be apt to break, when it reached the termination of the groove. He recommends the handle to be long, so that the knife may be easily pushed as far as the end of the staff.

OF WOUNDS OF THE RECTUM.

Unless the operator cut very carelessly, and turn the edge of the knife directly downwards, instead of obliquely sideways, the rectum cannot be injured. With a gorget, however, there is really more danger of such an accident, when the instrument slips out of the groove of the staff. Also, when the rectum is distended with feces, it is more exposed to injury; but, why should the surgeon ever operate, without having previously emptied that intestine? † But, if the accident were to happen, I think with Klein, that Desault's advice immediately to divide the rest of the gut down to the anus is entirely erroneous, as numerous instances have proved, that the wound may heal up of itself very well. I once saw a case, in which the rectum was wounded with a lithotomy-knife; but the cut in the bowel healed, and never gave any trouble.

OF WOUNDS OF THE PUDENDAL ARTERY.

No doubt, some of the profuse bleedings, which have taken place in lithotomy, have not proceeded from the pudendal artery itself, but either from the arteria profunda penis, when the incision was made too high up, or, in other cases, from the trunk of the

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* The construction of Langenbeck's knife, and the nature of the sliding guard for the point, when this is to be pressed into the groove of the staff, will be sufficiently intelligible by a reference to plate 7, fig. 5 and 4. The instrument there represented is calculated for an adult: a smaller one was used on a boy eight years old. See his Neue Bibliothek fur die Chirurgie, p. i. p. 431.

† Chir. Bemerkungen, p. 6.

perineal artery. I am surprised, however, that M. Roux [*] should assert, that, in directing the incision too far laterally, there is no risk at all of wounding the pudendal artery. This is an observation which is entirely erroneous, and might encourage the admirers of broad, long-edged gorgets to persevere with their instruments, until they had learned from experience, that lithotomy can never be done with safety, unless the incision be made, not only of sufficient size, but in a proper direction. Klein informs us, that he has twice had the ill luck to wound the trunk of the pudendal artery; the first instance was in a child four years of age; the hemorrhage was suppressed by introducing into the wound a piece of sponge, which was removed on the fifth day; the part was healed in a fortnight, but, for nine weeks, an incontinence of urine continued, which was ascribed to the pressure of the sponge. [†] The second case happened in a patient twenty-six years of age, from cutting too much sideways with Cline's gorget. After the extraction of the calculus, the wound was distended with a linen tent and a piece of sponge; and the patient kept quiet on the operating-table twenty-four hours, during all which time the assistants relieved each other alternately in making pressure on the wound. The patient lost four pounds of blood in the operation; his pulse was exceedingly feeble, and rapid; his countenance cadaverously pale; and his strength so much reduced, that the greatest fears were entertained for his life.

Surgeons should never try to tie the trunk of the pudendal artery, when it happens to be wounded, but remove the calculus, and then fill the wound with sponge. [‡] Even if it were practicable to tie this artery, it would not be advisable, previously to the extraction of the stone, the passage of which outwards would inevitably force the ligature off the vessel. [§]

OF INFLAMMATION WITHIN THE ABDOMEN AFTER THE OPERATION.

The majority of patients, free from visceral disease previously to the operation, who die in consequence of lithotomy, perish of peritoneal inflammation. Hence, on the occurrence of any tenderness, pain, and tension over the abdomen, with great restlessness, thirst, heat of the skin, and a small quick pulse, copious venesection should be put in practice, At the same time, eight or ten leeches should be applied to the hypogastric region. Much benefit will also be derived from the warm bath, fomentations, blisters, the exhibition of oleum ricini, and emollient clysters.

[†] Relation d'un Voyage fait à Londres en 1814; ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise p. 322. 8vo. Lond. 1815.

[†] Chirurgische Bemerkungen. p. 11.

[‡] A cannula should be passed through the sponge, for the easy evacuation of the urine. See C. J. M. Langenbeck über eine einefache und sichere Methode des Steinschnittes, p. 58. 4to. Würzburg, 1802.

[§] Klein, op. cit. pp 12—21.

I have seen several old subjects die of the irritation of a diseased, thickened state of the bladder, continuing after the stone had been extracted. They had not the acute symptoms, the inflammatory fever, the general tenderness, and tension of the abdomen, as in cases of peritonitis; but they referred their uneasiness to the lower part of the pelvis; and, instead of dying in the course of two or three days, as those usually do who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks. In these cases, opiate clysters, and blistering the hypogastric region, are proper.

In some instances of this kind, collections of matter form in the vicinity of the neck of the bladder.* Gangrene of the scrotum from the violence used in the extraction of the stone, and a large extravasation of urine in the cellular membrane, are most likely to be avoided by making a free and direct opening into the bladder, not too high up towards the scrotum.

CHAP. LVI.

SPINA BIFIDA, OR HYDRORACHITIS,

Is a swelling situated on the spines of infants, commonly on the lumbar vertebræ, occasionally on the dorsal, or cervical ones, and sometimes, though less frequently, on the os sacrum: it is filled with a limpid fluid, and arises from an imperfection of the bones, and a protrusion of the membranous lining of the spinal canal.

A tumour of a similar nature is sometimes seen on the head.†

In spina bifida, the swelling is soft, and gradually diminishes, or even quite disappears on pressure; but the tumour returns immediately the pressure is removed. A fluctuation is distinctly perceptible in it. The integuments retain their natural appearance. Sometimes, children experience pain, when the tumour is com-

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[*] In Italy, Nannoni and Flajani have for some years past performed lithotomy nearly in the same manner as Klein. In England, the knife has been preferred to the gorget by a large number of the best modern surgeons, some of whom, however, appear yet to be reluctant to abandon gorgets altogether. Mr. T. Blizard employed a particular knife for lithotomy. (See plate 7. figs. 5 and 6.) So did the late Mr. Gibson, whose instrument may be seen at any of the shops. Sir A. Cooper has sometimes operated with a convex-edged dissecting knife, made with a beak, by means of which it admits of being guided along the groove of the staff. Every knife for lithotomy should be, with the handle, seven or eight inches long; for, otherwise, it will not conveniently execute the deeper part of the incision in a fat subject.

[†] See Richter's Chirurg. Bibliothek, 9 band. p. 186.

pressed, or they are placed on their backs. The size of the swelling is various. One, situated on the sacrum of a healthy looking child, and larger than its head, was shown to me by my friend Mr. Maul, an eminent surgeon at Southampton; in general, the tumour seldom exceeds an orange in size.

The generality of children, affected with spina bifida, are deficient in strength, and subject to frequent diarrhœa. Incontinence of urine and the feces, emaciation, weakness, and even complete paralysis, are sometimes the concomitants of this serious complaint. However, some of the patients are, in every respect, except the tumour, perfectly healthy, and well formed.

The swelling consists of a sac, filled with an aqueous fluid, and composed of the integuments, and of the membranous sheath, which lines the canal for the spinal marrow. The lining of the spinal canal protrudes through a fissure in the vertebræ, which is owing to an imperfect formation of these bones, and is commonly found at their posterior part, where the spinous processes would otherwise be. The preternatural opening is sometimes confined to one bone, the base of the swelling being then small. In many instances, the ossification of the posterior portions of several vertebræ is incomplete, so that the canal for the spinal marrow resembles an open furrow. Even the whole spine, from one end to the other, may be thus imperfect.* The aperture has been known to extend through the body of the affected vertebræ, so that the finger could be passed quite into the abdomen.† In one example, there was not only a furrow in the vertebræ, but all the processes of these bones were wanting.‡

In general, the sac is filled with a clear, transparent fluid; but, occasionally, with a turbid, yellowish, or bloody secretion. The portion of the spinal marrow, surrounded by the fluid, is generally softened, and almost like mucus, or thin matter.§

Children afflicted with this disease, sometimes suffer, at the same time, from hydrocephalus. They seldom live longer than a year after birth. The tumour generally continues to enlarge. Occasionally, it inflames and ulcerates, and then death very soon follows. Children are observed to live longest, when the swelling is remote from the head. Few persons, labouring under this disorder, have attained the adult age, and their lower extremities have generally been in a paralytic useless state. A few examples are recorded, however, in which the patients lived to the ages of eight, seventeen ||, twenty ¶, and fifty.** I was once shown by Mr. C. Hutchison

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* Maret, Mémoires de Dijon, vol. ii. p. 105.

† Saltzmann De Tumoribus quibusdam Serosis Externis.

‡ Richter's Chirurg. Bibl. 4 b. 2 st. p 350.

§ Mémoires de l'Acad. de Dijon, vol. ii. and Richter's Anfangsgr. der Wundarzneykunst, band. 2. p. 256.; Dritte Auflage.

|| Acrell, K. Vetenskaps Ac. Hædligar, 1748, p. 91.

¶ Warner's Cases in Surgery, p. 136. edit. 4.

** Hochstaetter, Diss. de Spina Bifida, Altorf, 1703.

an enormous spina bifida in a young woman, at least twenty years of age.

Experience has fully proved, that puncturing the tumour with a lancet, and thus discharging the fluid, either at once, or gradually, cannot be done without putting the patient in the greatest danger, the consequences being for the most part fatal in a very short space of time. Also, when the swelling ulcerates, and bursts of itself, the child perishes; nor has tying the pedicles of such spinæ bifidæ as have narrow bases, proved more successful. Some years ago, Mr. Abernethy suggested the method of letting out the fluid, of closing and healing the puncture immediately afterwards, and repeating the same proceedings, as often as necessary.* He tried the plan in one instance, and though it was not attended with ultimate success, it did not bring on the suddenly fatal symptoms, which are the usual effects of letting out the fluid in the common way.

This last proposal, which originated with Mr. Abernethy, is highly important, inasmuch as subsequent operations have proved, that a practice, founded on the foregoing principles, may actually effect a cure of certain forms of a disease, that, until very lately, always baffled the art of surgery. It is to Sir Astley Cooper that we are indebted for some new attempts to cure the present disease; he tried the effect of puncturing spinæ bifidæ with a fine pointed needle, instead of a lancet, letting out the fluid from time to time, and promoting a closure of the opening in the spine, with a compress and bandage. When this practice answers, the adhesive inflammation obliterates the cavity, in which the fluid was collected, and the disease ultimately does not return. In one case, Sir Astley Cooper thus accomplished a perfect cure.† He adopts, however, a palliative, or a radical treatment, according to circumstances.

The first consists in treating the case as a hernia, and applying a truss to prevent its descent: the second in pricking the tumour with a fine needle, and producing adhesion of the sides of the sac, so as to close the opening in the spine, and stop the disease altogether. The first is attended with no risk; the second exposes the patient to much constitutional irritation; but, if successful, hinders the future recurrence of the disease. Even when the adhesive process cannot be effectually accomplished by the first plan, the second, or palliative method, may yet be tried.‡

There are numerous cases of spinæ bifidæ, however, which leave no hope of cure. The following examples of this description are pointed out by Sir Astley Cooper.

If the tumour be connected with an unnatural enlargement of the head, hydrocephalus internus is conjoined with spina bifida; and whether the radical, or palliative treatment of the tumour on the back be tried, the water will accumulate in the ventricles.

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* See Abernethy's Surgical and Physiological Essays, part 1 and 3.

† See Med. Chir. Trans. vol. ii. case 2. p. 326.

‡ See Case 4. lib. cit.

If the lower extremities be paralytic, or the feces and urine be discharged involuntarily, there is no hope of relief.

If the tumour should burst at the time of birth, or soon afterwards, little expectation of a cure could be indulged; for, although the opening in the skin might be closed with lint and adhesive plaster, and an union be produced, hydrocephalus internus would follow.

The deficiency of the spine is sometimes so great, that the tumour, at the time of the child's birth, is very considerable; the nerves protrude out of the spinal canal; and the spinal marrow is injured.

In this disease, purgatives and diuretics have been tried in vain; and no outward appications, excepting pressure, have been found to do the least good. Richter has suggested making two issues near the tumour *; but I do not know that the proposal brings with it much promise of utility. In short, in the present state of our knowledge, the practice, tried by Sir Astley Cooper, is the only one, in favour of which, facts and actual experience can be adduced; and if we except his cases, no instance of a spina bifida being cured is upon record.

When the disease does not admit of the radical, or palliative cure, the surgeon should instruct the friends of the patient to keep the tumour out of the way of every thing that has a tendency to make it inflame and ulcerate; and, if any thing at all be done, the swelling should be tenderly bathed, every now and then, with spirituous and mildly astringent lotions, with the view of averting inflammation and ulceration of the skin.

CHAP. LVII.

AMPUTATION.

Amputation is performed either in the continuity of a member, or at one of its articulations, each of which modes, however, cannot always be practised indifferently, the choice depending upon the situation, extent, and nature of the disease, or injury, for which the the removal of the part becomes indispensable. In all amputations done at the joints, it is the general practice to make a flap of flesh for covering the end of the bone; but when the operation is performed at another part of the limb, it is frequently at the option of the surgeon, whether the method adopted be *amputation with a flap*, or *amputation by a circular incision*. In all common instances, the latter practice receives the approbation of many of the best modern surgeons; but there are particular cases, in which a deviation from this mode, in favour of the flap operation, is commendable and useful, as I shall hereafter notice.

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* Anfangsgr. der Wundarzneykunst, band 2. p. 240.

Before proceeding to the description of the methods of taking off limbs, let me just remind the reader of two lines, which convey a piece of general information of high value in this part of surgery, and constitute, as it were, one of the best fundamental rules for our guidance in the performance of amputation: "as little of the flesh should be cut away, as possible; but the more bone is removed, the better."*

AMPUTATION OF THE THIGH.

The thigh should be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened, by means of a garter, to the nearest leg of the table.

TOURNIQUET.

The first thing is the application of the tourniquet. The pad of this instrument should be placed exactly over the femoral artery, in as high a situation as can conveniently be done. When the thigh is to be amputated very far up, a tourniquet is inconvenient, and, in this case, an assistant is to compress the femoral artery in the groin by any commodious instrument, having a round, blunt end, adapted for making direct pressure on the vessel, without injuring the integuments.

The latter method should only be adopted when the operation is to be done so high up, that the tourniquet would absolutely be in the way of the incisions. It is generally acknowledged, that some disadvantage results from the application of the tourniquet to a thigh on which amputation is practised, because the instrument tends to obstruct the full retraction of the muscles after they are divided. Yet, in ordinary cases, it is by no means advisable to prefer compression of the femoral artery in the groin by an assistant to the employment of a tourniquet. Putting out of present consideration, his being liable to fail in regularly commanding the flow of blood through the artery, on account of the violent struggling of the patient, we are to remember, that besides this vessel, there are others concerned in supplying the thigh with blood, which are branches of the internal iliac, and come out of the lower openings of the pelvis; as, for instance, the arteria obturatoria, the iliaca posterior, or glutea, and the ischiadica. Hence, pressure upon the femoral artery in the groin can never stop the bleeding, but incompletely; and I leave it to every man of experience to contemplate, how many cases there are, in which not a drop of blood should be unnecessarily spilt. I would even urge, that, in numerous instances, in which the patient is much reduced at the time of submitting to the operation, any considerable hemorrhage must be regarded as a fatal occurrence.

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* "On doit couper des chairs le moins qu'il est possible, et des os, le plus qu'on peut." J. L. Petit, Traité des Maladies Chirurgicales, tom. iii. p. 150.

FIRST INCISION.

The operator is to stand on the right side of the patient, whether the right or left limb is to be removed. By this means, he acquires the advantage of always having his left hand next the wound, so as to be of very essential assistance. This advantage more than counterbalances the inconvenience of having the right limb in the way of the operator, when the left thigh is that which is to be amputated.

An assistant, firmly grasping the thigh with both hands, is to draw upward the skin and muscles with some force, while the surgeon makes a circular incision, as quickly as possible, through the integuments, down to the muscles. When the integuments are sound in the place of the incision and above it, their retraction by the assistant as soon as they are cut through, and a very slight division of the bands of cellular substance with the edge of the amputating knife towards the point, will generally preserve a sufficient quantity for covering, in conjunction with the muscles cut in a mode about to be described, the extremity of the bone; and the painful method of dissecting up the skin from the fascia, and turning it back, previously to dividing the muscles, may be considered useless and improper in all amputations of the thigh, where the skin retains its natural moveableness and elasticity.

This practice of dissecting up and turning back about a couple of inches of the skin, in cutting off a thigh, has been censured by some of the first practical surgeons which this country ever produced. Thus it was disapproved of long ago by Bromfield; and even Alanson, who praised the method in the earliest edition of his book, thought proper afterwards, when further experience had brought his judgment to greater maturity, to deliver a very different sentiment upon the subject. From the example set me by some of the former surgeons of St. Bartholomew's-hospital, during my apprenticeship there, I also once fancied, that, in amputation of the thigh, a considerable dissection of the skin from the muscles, previously to the division of the latter, was a matter of absolute necessity. The experience, however, which I had in the course of the last two wars, soon produced in my mind a different conviction.

For some useful remarks on this point, the profession are indebted to Mr. Guthrie, who has explained, that, in primary amputations, or those done at an early period after the receipt of a gunshot injury, while the part of the limb, where the incisions are to made, is in the natural state, and the skin loose and moveable, "it will be sufficient to touch the thread of membrane, or fascia adhering below, with the point of the same (the amputating) knife, to give ample covering for an excellent stump, without putting the patient to the torture of having his skin pinched and dissected back, for the space of a couple of inches, for four or five minutes." At the same time, he particularly insists on the utility of dividing the fascia and integuments together, by which means, the latter can be retracted much further than would otherwise happen.

In operations, however, performed from the third to the twelfth day after the receipt of the wound, and near the injured parts, Mr. Guthrie admits the propriety of dissecting the integuments a little way up from the fascia, as in these cases the retraction, effected by the assistant and the natural elasticity of the skin, will not avail in saving enough of it to cover the surface of the stump well; yet even here he rightly disapproves of turning back the separated integuments, as is often done, like the top of a glove.

In secondary amputations, (says he,) with the exception of those, in which the operation is required in parts actually unsound, the integuments may be sufficiently retracted, without any formal dissection of them from the subjacent fascia.*

Besides the objection to such dissection, on the ground of the great agony which it excites, it should never be done unnecessarily on another account, particularly insisted upon by Loder, viz. because a redundance of skin is apt to serve as a lodging place for matter, and be the means of preventing the thing which is always particularly desirable, namely, union by the first intention.†

It is difficult to give any exact general rules for determining how much skin is to be saved. According to Loder, the less bulky the limb is, the less need the edge of the integuments project beyond the surface of the divided muscles; and the more fat there is, the greater must be the length of the preserved skin. In the first case, (says he,) about half an inch will be enough; in the second, an inch, or more, will be requisite. The more obliquely the incision is made though the muscles, the less necessary will skin be for covering them afterwards, because their edge will be thin. But, in the opposite case, a larger piece of skin will be wanted for covering the bulky ends of the muscles. When the parts are sound above the place of the incision, the greater or lesser breadth of the projecting edge of the skin will always depend upon the retraction of it at the period of its division. If the assistant draw it back with force, more will be saved; and if it be drawn back but a little way, the part projecting beyond the edge of the muscles will be but small. The assistant, in drawing back the integuments, is to be particularly careful to do this evenly and smoothly all round the member, so that the skin may not be wrinkled, nor pulled up more in one place than another.*

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* G. J. Guthrie on Gunshot Wounds of the Extremities, requiring the different operations of Amputation, with their after-treatment, &c. pp. 84, 85. 8vo. Lond. 1815.

† Chirurgische-Medicinische Beobachtungen, p. 6. The above objections to the common mode of dissecting up the skin freely, and turning it back, must be limited to amputations of the thigh and upper arm; for, in removing the lower extremity below the knee, the preservation of skin enough to cover well the tibia, and outer part of the stump, require something more than drawing the integuments upwards at the period of their division.

I have said, that the surgeon is to begin the operation by making an incision through the skin all round the limb. The generality of surgeons, very rightly considering this as one of the most painful parts of the operation, do it with as much quickness as possible, and therefore carry the knife all round the member with one sweep, the hand which holds the knife being carried round under the limb until the edge can be placed perpendicularly on the skin covering the extensor muscles. Excepting the appearance of greater skill, and a little greater quickness, however, the foregoing mode of dividing the skin all round the limb with one stroke of the knife, has no particular advantage over the method of completing the cut with two sweeps of the knife.

OF DIVIDING THE MUSCLES.

The ancient surgeons used to cut directly down to the bone at once, and the frequent consequence was a conical, or sugar-loaf stump, extremely unfit for bearing any degree of pressure, and, therefore, kept healed with difficulty. The end of the bone, in fact, often protruded beyond the soft parts. At length, however, the improvement was made of cutting the integuments through first, and then the muscles: a method well known amongst surgeons by the name of the *double incision.*

But, although the double incision enabled the surgeon to save skin, and saw the bone higher up, a conical stump, and projection of the bone, sometimes followed. The great innovations, which ultimately proved nearly effectual in the prevention of such tedious miserable cases, were, besides the saving of skin, the oblique division of the muscles, suggested by Alanson; the cutting of the loose muscles first, and the fixed ones afterwards, proposed by Louis; and the immediate closure of the wound, after the bleeding had been stopped, the great utility of which was first brought to light in the early trials of what are called flap-amputations.

M. Louis, for whose memory every admirer of surgical science ought to entertain sincere respect, first discerned the principal cause of the projection of the bone. He observed, that the muscles of the thigh became retracted in an unequal manner, when divided; those which are superficial, and extend along the limb more or less obliquely, without being attached to the bone, becoming retracted with greater force, than others, which are deep, and, in some measure, parallel to the axis of the femur, and fixed to this bone throughout its whole length. Their retraction begins at the moment of the operation, and, for some time afterwards, continues unfinished. Hence, the effect should be promoted, and be as complete as possible, before the bone is sawn. With this view, M. Louis practised another kind of double incision; by the first, he cut, at the same time, both the integuments, and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely connected with the femur. On the first deep, circular cut being completed, M. Louis used to remove the band encircling the limb above the track of the knife, in order to allow the divided muscles to become retracted without any impediment, and he then cut the deep muscles, on a level with the surface of those which had been first divided, and which were now in a retracted state. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided.*

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* Loder, lib. cit. p. 7.

Alanson's mode of amputating was as follows: —The integuments having been divided by a circular wound, the knife was applied close to the margin of the retracted skin, upon the inner edge of the vastus internus, and at one stroke, an incision was made obliquely through the muscles, upward in respect to the limb, and down to the bone: in other words, the cut was made in a direction which lay the bone bare, about two or three finger-breadths higher, than a perpendicular incision would have done. The operator now drew the knife towards himself, so that its point rested upon the bone, still observing to keep the instrument in the same oblique position, in order that the muscles might be divided all round the limb in that direction, by a proper turn of the knife. During the performance of this movement, the point of the knife was kept in contact with the bone, round which it revolved.†

Many writers have objected to the difficulty of making the oblique incision exactly as Alanson has directed, and Mr. Hey even questions the possibility of the practice, without a different result from what Mr. Alanson intended. It is evident (says Mr. Hey) that a conical incision through the muscles of the thigh cannot be made with a continued stroke, in the usual mode of amputating. For, supposing the edge of the knife to have once penetrated obliquely through the muscles, so as to be an inch higher, when arrived at the bone, than when it penetrated the surface; if the incision be continued with a flowing stroke, the knife must then cut the surface of the undivided muscles an inch higher, than at the commencement of the incision.* How far it is actually practicable to keep the point of the knife in contact with an exact circle on the bone, during the oblique passage of the instrument all round the member, it is not for me to say, because, seeing its difficulty, I have never attempted it; nor can I suppose, that Alanson himself ever really did what he literally recommends. Of one thing also I am sure, that I have seen many surgeons, in their attempt to do this business after Alanson's directions, get so high up as to cut the subjacent reflected skin.

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* See Mémoire sur la saillie de l'os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prévenir. Also, Second Mémoire sur l'Amputation des Membres, *Mém. de l'Acad. de Chirurgie*, tom. v. p. 244., and 401.. edit. in 12mo. And Nouvelles Observations sur la Rétraction des Muscles après l'Amputation de la Cuisse, et sur les moyens de la prévenir. Op. cit. tom. xi. p. 63. edit. in 12mo.

† See Alanson's Practical Obs. on Amputation, 2d ed.

The late Mr. Hey is not the only, nor the earliest writer, who has pointed out the inaccuracy of Alanson's directions. Richter has offered several judicious criticisms upon them, which perfectly coincide with Mr. Hey's views. It is remarked, that when the knife, with its edge turned obliquely upwards, has reached the bone, a flap is actually formed on the side where the incision is practised: and the edge of the knife is now three inches higher than the cut in the skin. In this state, the surgeon cannot possibly continue the incision. The only thing which he can now do, is to place the knife on the opposite side of the thigh in the same manner, and make a flap there. The operation, says Richter, is then rather a flap-amputation, not done in the best way, than an operation really practised as Alanson thought possible. By following precisely his instructions, Richter thinks it would be quite impracticable to form a hollow stump, though perhaps it might be done by reiterated oblique strokes of the knife all round the limb. But, he exclaims, what a stump there would then be, and what a method of operating! He comments also on the difficulty of making a knife cut properly by mere pressure, as would be the case, were its point kept unremittingly against the bone, in carrying the incision round the member; on the preferable nature of amputation with a flap to this method, the wound left by which is longer in healing; and on the pain and delay of separating the skin to be saved, a proceeding altogether unnecessary in amputating with a flap.† These observations are partly correct; but they are to be regarded as coming from a surgeon, who was extremely partial to the flap-operation, and did not attach the proper value to the suggestion of making in a right manner the oblique division of the muscles.

Many excellent surgeons, whom I have seen operate, do not cut at once obliquely down to the bone, after the integuments have been divided and retracted; but so far adopt the principles of M. Louis, as to divide the loose muscles first, and lastly, those which are intimately attached to the bone, taking care, with a scalpel, to cut completely through the deep muscular attachments, about an inch higher up, than could be executed with the amputating knife itself. This last measure causes very little pain, and has immense effect in averting all possibility of a subsequent protrusion of the bone, or of a bad sugar-loaf stump. Such used to be the practice of Mr. Hey, who calls it the *triple incision*[*]: and Mr. Guthrie[†], in his account of amputation of the thigh, is a decided advocate for a similar mode. In this method, however, the advantage of the oblique incision through the different layers of musles, was invariably retained. While I served in the army, I always endeavoured, in the performance of amputations, to combine, as far as circumstances would allow, the principles of Alanson with those of M. Louis. This is certainly a better mode of operating, than that in which Mr. Alanson's directions are precisely followed. However, I am obliged to state, that the attempt to divide the loose muscles first, and then the more fixed ones, is apt to make a hasty surgeon cut the whole, or a great part of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding which can be instanced. To say how unnecessary it is to divide any muscle, more than once, is as needless as to remind the reader of its doubling the agony of a most severe operation.

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* Hey's Practical Observations in Surgery, p. 529. edit. 2.

† Anfangsgr. der Wundarzn. b. vii. p. 187.

In the descriptions of amputation, usually met with in books, some pains are taken to expose the advantages of holding the limb in a half-bent position while the division of the muscles is going on, in order that the flexor and extensor muscles may be in an equal relaxation. This advice may be good, if it can be followed: and the plan of relaxing each set of muscles as much as possible, by a change in the posture of the member when they are about to be cut, as has been sometimes recommended, might be still more rational as being conducive to the preservation of a greater proportion of flesh. But, unfortunately, the operator, who begins to think of these projects when his patient is upon the table, generally finds them impracticable, the disease, or injury having already so fixed the posture of the member, that little or no deviation from it can be made, without the greatest difficulty and pain.

USE OF THE RETRACTOR.

Having cut completely down to the bone, a piece of linen, somewhat broader than the stump, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. Thus the retractor will evidently keep every part of the surface of the wound out of the way of the saw. I have seen the saw do so much mischief, in consequence of neglecting to use the retractor, that my conscience obliges me to censure the employment of the saw, without a defence of the soft parts by this simple contrivance. I think no one will say, that the retractor can do harm; and I know, that many who have been with myself eye-witnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts skilfully divided; and the operators, directly afterwards, lose all the praise, which every one was ready to bestow, by their literally sawing through one half of the ends of the muscles, together with the bone. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up, than he otherwise could do.*

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[*] Hey's Practical Observations in Surgery, p. 526. edit. 2.

[†] On Gunshot Wounds of the Extremities, &c. p. 86.

OF SCRAPING THE BONE.

Another proceeding, deserving reprobation, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. This is a sentiment, in which I must still continue to join the experienced and judicious Petit, notwithstanding a modern author † has actually devoted a section of his book to the praise of what is here particularly condemned. The chief argument for the practice, urged by Brunninghausen, is that, by scraping the periosteum upwards from the bone, a portion of the detached membrane will yet remain connected to the muscular fibres, thus pushed back, and afterwards admit of being brought down with them over the sawn bone. As, however, I have seen the bone extensively scraped, without an exfoliation being a regular effect of the method, I do not consider, as Petit did, that a part of the bone must *inevitably* die, after the periosteum is thus freely scraped away; but I look upon the improper and useless separation of this membrane as one of the circumstances which tend to produce the exfoliations, that sometimes happen after amputations. At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum.‡ All that the operator ought to do, is to take care to cut completely down to the bone, round the whole of its circumference. Thus a circular division of the periosteum will be made, and here the saw should be placed.

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* Petit earnestly recommends the employment of a linen retractor: when a surgeon once told him, that he did not use it, because the teeth of the saw were apt to get entangled in it, he answered: "Il est vrai que cela peut arriver lorsqu'on ne sait pas le placer; les meilleures manières d'opérer ont leur inconvénient, si on neglige les circonstances qui les font réussir." Traité des Maladies Chir. t. iii. p. 152.

† H. J. Brünninghausen, Erfahrungen und Bemerkungen über die Amputation, p. 67. Bamberg, 1818.

‡ Petit's opinion is thus expressed: "Si par trop d'exactitude, on dépouille trop en avant les os de leur périoste, l'exfoliation, qui devient inévitable dans ce cas, se fait long-temps attendre, et retarde beaucoup la guérison: je préfere donc de scier le périoste, avec les os; j'ai toujours éprouvé que cette méthode etoit moins douloureuse et qu'elle évitoit souvent l'exfoliation." Vol. cit. p. 158.

In confirmation of the correctness of the foregoing advice, I beg leave to quote what Richter has said upon the subject of scraping the periosteum off the bone. The thin layers of flesh (says he) which, when the soft parts are drawn up, usually remain here and there upon the part of the bone about to be sawn, the surgeon should now cut carefully through with a scalpel, together with the periosteum, as high as possible, and close to the slit in the retractor. It is quite unnecessary, he observes, to scrape away the periosteum from the place where the saw is to be applied. Neither this membrane, nor a few slender muscular fibres, can hinder the action of the saw, and, after the last sweep of the scalpel, they are lifeless and insensible.*

OF THE MANNER OF SAWING THE BONE.

As Petit justly remarks, this part of the operation is by no means easy to a person unaccustomed to handle a saw. The principal difficulty arises from the bone being sawn up in the air (as it were); at least, the part is in general but very imperfectly fixed by two persons, who, however strong they may be, cannot resist the saw, and hinder the limb from being shaken, whereby the direction of the instrument becomes altered. Besides, the two assistants rarely act so well in concert together as always to hold the limb in the same direction, and with an equal degree of strength. It is true, such irregularity is not of much consequence at first, while the bone is not half sawn through; but, as soon as the instrument has cut to this depth, the irregular movements of the assistants, who hold the limb, make the sawn surfaces come nearer together, and the saw is so pinched or locked betwixt them, that it cannot stir in one direction, or the other.

A skilful surgeon (observes Petit) may obviate the difficulty by supporting the part with his left hand, and resisting or yielding at seasonable opportunities to such circumstances as impede the motion of the instrument. But, the difficulty may depend upon the saw itself, when its blade is not duly stretched, the teeth not well turned alternately to the right and left, their points not in good order, their edges not sharp enough, or they are not filed obliquely, so that the bone-dust may be readily thrown off to each side. The latter object requires also, that the blade of the saw at the teeth-part should be rather thicker than the rest of it, or else the fissure in the bone would be completely filled with the instrument, and the bony particles, not easily escaping, would obstruct the movements of the saw. In order to saw the bone as close to the flesh as possible, Petit says the nail of the index finger of the left hand is to be placed on the point where the sawing is to begin. Many surgeons however, find it more convenient to use the left thumb-nail for this purpose. The flesh being retracted, the saw is now to be applied exactly at the angle formed by the nail and the bone; and the instrument is to be worked very gently, and with scarcely any more pressure than that of its own weight, until a groove is cut, from which it will not start, when the force is be gradually increased.*

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* Anfangsgr. der Wundarzn. p. vii. p. 179.

The edge of the saw should cut with both edges, whether the instrument be moved backwards or forwards, by which means as a modern writer† has remarked, the operation will be expedited, and the splintering of the bone, when it is nearly divided, prevented, inasmuch as the surgeon, when he uses a saw, which cuts in both directions has it in his power to finish the latter part of the division of the bone entirely with backward sweeps of the instrument, which are always the most regular and gentle.

In order to form a groove for the saw, it is best to begin by drawing the instrument across the bone with a backward sweep, the teeth near the handle being first applied to the part close to the operator's left thumb, or finger-nail, and the whole extent of the edge is then to be steadily and briskly drawn back to the point. The movements of the saw should never be short and rapid, but every stroke of the instrument should be long, bold, and regular, without too much pressure, which is one common cause of the awkwardness so often displayed in this part of the operation. When about two-thirds of the bone are cut through, the pressure and force must be lessened, and towards the end of the business, two or three gentle movements of the saw backward will complete it, without risk of an extensive splintering. In the latter part of the sawing, the assistant who holds the leg, must be very careful to avoid depressing the condyles of the femur, as it would inevitably break the bone, previously to its complete division. Indeed, it is difficult to say, whether this mismanagement, or the rough unskilful mode of using the saw itself, is the most frequent cause of the latter accident. The assistant certainly has rather a delicate task to perform, because if he raises the limb too much, he pinches the saw; if he depresses it, he breaks and splinters the bone.

If the bone should break, before the sawing is finished, the sharp projecting spiculæ, thus occasioned, must be removed by means of a pair of bone-nippers.

OF STOPPING THE HEMORRHAGE.

After the removal of the limb, the femoral artery is to be taken hold of with a pair of forceps, and tied, without including the accompanying branches of the anterior crural nerve in the ligature.

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* Petit, Traité des Maladies Chir. t. iii. p. 159, 160.

† G. J. Guthrie on Gunshot Wounds of the Extremities, &c. p. 89.

None of the surrounding flesh ought to be tied, though the ligature should be placed round the artery, just where it emerges from its lateral connections. Desault recommends tying the femoral vein, as well as the artery; because when the former remains open, and the bandage compresses the upper part of the limb too forcibly, the venous blood returns downward, and hemorrhage takes place.* Mr. Hey also met with a few instances of bleeding from the femoral vein, and therefore, he generally inclosed it in the ligature along with the artery.† When the two vessels lie near each other, as is frequently the case, Desault advises the surgeon to introduce one branch of the forceps into the artery, and the other into the vein: their mouths are then to be drawn out, and tied with one ligature. When, however, they are not so close together, they require two separate ligatures. The smaller arteries are usually taken up with a tenaculum. After tying as many vessels as require it, one-half of each ligature is to be cut off near the surface of the stump. The right qualities of ligatures, used for securing blood-vessels, having been considered in the chapters on hemorrhage and aneurism, it is unnecessary now to return to that interesting topic; nor shall I here speak again of the proposal of removing both ends of the ligature close to the knot.

When the large bleeding vessels have been tied, the tourniquet should be slackened, and the wound well cleaned, in order to detect any vessel, which may lie concealed with its orifice blocked up by coagulated blood; and, before the dressings are applied, the whole surface of the wound should be examined with the greatest accuracy. By this means, a pulsation may often be discerned, where no hemorrhage has previously appeared, and a small clot of blood may be removed from the mouth of a considerable artery.

As the lodgment of much coagulated blood would be unfavourable to the speedy union of the wound, the surgeon has an additional motive for being careful to make its whole surface clean with a sponge and water, before it is finally closed. The number of arteries, requiring to be tied, will depend very much upon the incision having been done upon sound and uninflamed parts, or upon parts in a state of inflammation, swelling, and disease. This accounts for the truth of an observation, made by military surgeons, that, in amputations done immediately, or soon after the receipt of an injury, there are fewer vessels to be taken up, than in what are termed secondary, or long-delayed operations.‡

I have occasionally seen examples, in which it has not been necessary to take up a single artery. A young child was run over by a hackney coach, the wheel of which crushed the lower part of the leg, and rendered immediate amputation necessary. The operation was done by the late Mr. Ramsden without delay; no vessel was tied; and the stump healed without any subsequent bleeding. This was one case which I saw, and attended myself. In St. Bartholomew's-hospital, some instances also fell under my notice, where arteries like the ulnar and anterior tibial, even in adults, required no ligature. The absence of hemorrhage is sometimes explicable by the clot of blood, formed in the large vessels in cases of gangrene. Thus, a modern surgeon tells us, that he amputated the arms of two Cossacks, four months after the limbs had been shot through above the elbow, and while they were affected with hospital gangrene: not a vessel was tied; no secondary hemorrhage arose; and the stumps healed in the most favourable manner.*

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* Œuvres Chir. de Desault par Bichat, tom. ii. p. 550. Venous hemorrhage almost always ceases on the removal of the tournequet, or any other tight bandage.

† Hey's Practical Obs. in Surgery, p. 530. ed. 2.

‡ See Guthrie on Gunshot Wounds, &c. p. 90.

OF DRESSING THE STUMP.

The skin and muscles are now to be placed over the bone, in such a direction, that the wound may appear only as a line, across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is commonly supported in this position, by long strips of adhesive plaster, applied from below upwards, across the face of the stump. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguent. sperm. cet., in order to keep them from sticking, which becomes a troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross-bandages and a common linen roller, applied in a spiral way round the limb, from above downward. The first turn of the roller, indeed, should go round the patient's body; and, being continued down, will fix the two cross-bandages over the end of the stump. Here, as after all other operations, the dressings should generally be superficial, and make no compression: if the vessels have been properly secured, there is no risk of hemorrhage; and if they have not, it is not a little degree of constriction that will hinder bleeding. Besides, much pressure has the serious inconvenience of irritating the parts, exciting inflammation and suppuration, causing absorption of the cellular membrane, and a sugar-loaf stump.†

The elastic woollen cap, sometimes placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremity of the stump, and, as it must also heat the part, its employment should be discontinued.

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* Klein Practische Ansichten der bedeutendsten Chirurgischen Operationem, 1tes Heft. p. 62. 4to. Stuttgart, 1816.

† Œuvres Chir. de Desault, t. ii. p. 552.

The stump should rest upon a pillow of moderate thickness, for, bending the thigh-bone too much produces a retraction of the flexor muscles.

If possible, the dressings should never be removed before the third day; but, in general, it is quite soon enough to change them on the fourth or fifth: when the weather is hot, and there is much discharge, they should be taken off earlier than under other circumstances. The favourable healing of a stump will depend very much upon the skill and tenderness with which the dressings are changed, more especially, the first dressings. In order to facilitate the removal of the plasters, they should by first thoroughly wet with warm water, which is not to be rubbed upon them with a sponge, but allowed to drop, or flow over them. Each strip of plaster should be taken off, by raising its ends, and drawing them gently up together towards the extremity of the stump, by which means, the surgeon will avoid pulling the recently united parts away from each other. During the change of the dressings, an assistant is always to support the flesh and keep it from being retracted, and for the more complete prevention of the same disadvantage, it is a good rule never to let every strip of plaster be off the limb at one time; but, as soon as some are removed, to put on others, before the rest are loosened and taken away. It is hardly necessary to add, that, when matter is collected within the stump, it should be very gently compressed out with the sponge, in doing which, the pressure should be so regulated, as not to force back the flesh.

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist, if the trial create pain. One would hardly try, whether the ligature on the great artery were loose, before the eighth or ninth day.

FLAP-AMPUTATION OF THE THIGH.

Although this operation is not generally regarded as the best method for ordinary cases, its advantages, under particular circumstances, begin to be acknowledged by many surgeons of judgment and experience. In Germany, as far as I can judge from the latest works published there on the subject of amputation, flap-amputations have numerous advocates; and, I believe, that whoever will take the trouble of inquiring into the actual state of surgery in that country, will find the method of operating quite as frequently practised as the circular incision.* Desault employed both modes on the thigh, or arm, indifferently; though he did not apply the flap-amputation to the leg, or fore-arm.* In England, where the latter method first originated with Lowdham, and where it has at various periods been strongly commended and improved by several men of great eminence, it has not many advocates for its general adoption, though Mr. Liston, Mr. Symes,† and some other respectable surgeons at Edinburgh, urgently recommend it for ordinary practice. The chief objections to the operation, when proposed as the common method, arise from two considerations: first, its greater pain‡, than that of the usual mode: secondly, its shortening the limb more than is necessary. Yet, all British surgeons agree, that flap-amputations are generally the best, when a limb is to be taken off at a joint, and also, in every instance in which the skin and soft parts are quite sound on one side of a member, while, on the other, they are diseased, or destroyed for a considerable extent, upwards. Here, amputating with a flap will be the means of preserving more of the limb, than could be saved by the circular incision, and becomes praiseworthy on the very same principle, which renders the latter method most eligible under ordinary circumstances.

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* Consult particularly C. C. Siebold, Diss. de Amputatione femoris cum relictis duobus carnis segmentis, Wirceb. 1782.; Gräfe, Normen für die Ablösung grösserer Gliedmassen, Berlin, 1812.; Richter, Anfangsgr. der Wundarzneykunst, b. vii.;

As Mr. Hey has remarked, sometimes the integuments of the thigh are in a morbid state on one side of the limb, while they are sound on the other. In this case, a longer portion of integuments and muscular flesh must be left on the sound side; which will not prevent the formation of a good stump. The morbid state of the anterior or posterior side of the thigh sometimes extends so far above the knee, that it is advisable to amputate with a flap.§

At the upper part of the thigh, Mr. Guthrie ‖ prefers amputating with a flap as a general practice; but, unless there were some particular circumstances present, some motives like those already suggested, I should not be disposed to select, what is allowed to be, by far the most tedious and painful method of amputating. Were the thigh-bone, however, injured high up, and had gangrene extended about the trochanter major and posterior upper part of the thigh, if the head of the femur were sound, and the patient able to

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Kap. 7. 8vo. Göttingen, 1804.; Klein, Practische Ansichten der bedeutendsten Chirurgischen Operationen, 1tes Heft. 4to. Stuttgart, 1816.; H. J. Brunninghausen, Erfahrungen und Bemerkungen über die Amputation, 12mo. Bamberg, 1818. This last surgeon recommends making the flaps from the integuments, and not from the muscles, which, he asserts, shrink and diminish after the operation, so as not to form a durable cushion for the end of the bone.

* Œuvres Chirurgicales de Desault, tom. ii. p. 547.

† See Edinb. Med. and Surg. Journ.

‡ Klein, who has decided in future always to amputate the thigh with a flap, in consequence of this method forming a better stump, and the wound healing in less time, than after the circular incision, owns that the operation is attended with a great deal more pain. See Practische Ansichten der bedeutendsten Chirurgischen Operationen, 1tes Heft. pp. 34, 35.

§ Hey's Practical Observations in Surgery, p. 531. ed. 2.

‖ On Gunshot Wounds of the Extremities, p. 200.

bear the operation, I would then do as Klein did—make a flap at the inner and upper part of the member.* The execution of a flap-amputation of the thigh will be attended with some difference, according as the soft parts on all sides of the limb are sound, or not. When, in consequence of the flesh being injured or diseased on one side, the flap must be entirely formed on the other, it will be necessary to save more skin and muscle in the latter situation, than if the surgeon had it in his power to form two flaps for covering the end of the bone. In performing the latter operation on the thigh, Desault used to grasp the flesh on its inner side with his left hand, and pass a straight, narrow, sharp-pointed knife, with its edge turned towards the knee, through the soft parts thus taken hold of, pushing it on from the fore-part of the thigh, until the point came out at the back of the limb. The incision was then extended obliquely downwards, so as to make a flap about four inches in length, comprehending part of the cruralis, the vastus internus, the femoral artery and vein, the anterior crural nerve, the triceps, sartorius, gracilis, semi-membranosus, and semi-tendinosus muscles. This first flap was then reflected, and the femoral artery and vein, and the trunk of the profunda tied. The external flap was next formed in a similar way, and consisted of the rest of the cruralis, the rectus, the vastus externus, and biceps. The two flaps were then held back, the bone sawn through as high as possible, the other bleeding vessels secured, and lastly the flap brought down, so as to meet in a perpendicular line, and cover the end of the bone.†

AMPUTATION BELOW THE KNEE.

In the thigh, amputation is done as low as the case will allow. In the leg, the common practice is to make the incision through the integuments sufficiently low to enable the operator to saw the bones, about four inches below the lower part of the patella. This is necessary, in order to have a sufficient surface in front of the limb for the application of a wooden leg, and not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided.

The tourniquet should be applied to the femoral artery, two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle: this is a much more convenient situation, than the ham. The leg being properly held, the integuments should next be drawn upward by an assistant, while the surgeon, with one quick stroke of the knife, divides the skin completely round the limb. Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw the bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. I know, many fancy that it diminishes the chance of the fibula being splintered, as this bone is completely divided rather sooner than the tibia. But, as splintering the bones arises from the assistant, who holds the leg, depressing the limb too much, it would be difficult to explain, why the two bones should not be splintered, when a certain thickness of them had been sawn through, if the leg were too forcibly depressed.

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* Practishe Ansichten der bedeutendsten Operat. p. 39. 1tes Heft. The soldier, thus treated, got well in three weeks. See also another case, p. 42., in which it was necessary to make a flap at the inside of the limb, in consequence of a sinus extending far up towards the buttock, and rendering a circular incision unadvisable. This operation succeeded, though done only one inch below the great trochanter.

† See Œuvres Chir. de Desault, p. 539. As taking up the vessels before the bone is sawn keeps the patient in an anxiety, which never ceases before the limb is off, I should prefer imitating Klein, and saw the bone, before searching for the artery, as in a common amputation. See Klein's Practische Ansichten der bedeutendsten Chir. Operat. 1tes Heft, p. 37.

Having made a circular division of the integuments, the next object is, to preserve skin enough to cover the front of the tibia and the part of the stump corresponding to the situation of the tibialis anticus, extensor longus pollicis, and other muscles, between the tibia and fibula, including those covering the latter bone. Throughout this extent, there are no bulky muscles which can be made very serviceable in covering the end of the stump, and consequently the operator must here save sufficient skin, by dissecting it up, and turning it backwards.

On the posterior part of the leg, the skin should never be detached from the large gastrocnemius muscle which, when obliquely divided, will, with the soleus, here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the incision of the integuments, and cut in the Alansonian way through the muscles of the calf, from the inside of the tibia, quite to the fibula. Then the flap, formed by the calf of the leg, is to be held back by the assistant, while the surgeon completes the division of the rest of the muscles, together with the interosseous ligament, by means of the catling, or a long, very narrow, double-edged knife.

In amputating below the knee, particular care must be taken to cut every fasciculus of muscular fibres, before the saw is used. Every part being divided, except the bones, the soft parts are next to be protected from the saw, by a linen retractor, made with three tails, one of which is to be drawn through the space, between the tibia and fibula.

In the leg, only three principal arteries require ligatures; viz. the anterior and posterior tibial, and the peroneal, arteries.

When the wound is to be dressed, the soft parts preserved for covering the bones, should be brought together, so as to make the line of their union not transverse, but obliquely perpendicular, the lower end of it being more external than the upper. Thus the tibia and fibula may be effectually covered, without the strips of adhesive plaster forcibly pressing the skin against the sharp edge of the tibia. The plaster, which makes most pressure, should go over the centre of the stump, at the point corresponding to the interosseous space.*

AMPUTATION OF THE ARM.

The structure of the arm bears a great analogy to that of the thigh. There is only one bone, round which the muscles are arranged, the deep ones being adherent to the os brachii, while the outer ones extend along the limb, without being attached to this bone. The first are the brachialis internus, and the two short heads of the triceps; the others are, the long portion of the latter muscle, and the biceps. Hence amputation, in this situation, is performed in a very similar manner to the same operation on the thigh, unless it be necessary to remove the limb above the insertion of the deltoid muscle.†

The patient may either sit on a chair, or lie near the edge of a bed, and an assistant is to hold the arm in a horizontal position, if the state of the limb will allow it. The pad of the tourniquet is to be applied to the brachial artery, as high as convenient. The assistant is then to draw up the integuments, while the surgeon makes the first circular incision. In this operation, the skin need only be detached from the muscles to a very trivial extent, as there is no risk of not having sufficient flesh and integuments to cover the bone. When the muscles, in front of the arm, are to be divided, the elbow should, if possible, be bent by the assistant who holds the arm, and if the joint were quite moveable, the limb might be placed in a straight posture, when the division of the triceps is to be effected. It is best to divide the biceps first, and after the retraction of this loose muscle, to cut the brachialis internus, which is fixed to the bone, by an incision sloping obliquely upward.

The triceps may be cut through at once, by one sweep of the knife, with its edge turned obliquely upward. The other proceedings do not require description after the account, already given, of what is necessary in amputating the thigh.

When it becomes indispensable to amputate the arm very high up, there is no room for the application of the tourniquet. In this instance, the subclavian artery is to be firmly compressed, as it passes over the first rib, by an assistant, who can most effectually accomplish this important object, by pressing the vessel from above the clavicle with the handle of a key, or any other suitable instrument. The danger of a sudden profuse hemorrhage having been thus guarded against, the operation is to be done variously according to circumstances. When the bone can be sawn through below the insertion of the pectoralis major, there is no peculiarity in the method of operating. But, if it be necessary to take off the limb still higher up, the circular incision is not adopted. Here some surgeons make a flap of the deltoid muscle, and commence with making an incision corresponding to its margin in shape and situation. Then the muscle is to be detached from the bone beneath, so as to form the flap, which is to be turned up. The operation is now finished by cutting through the other soft parts, from one side of the base of the flap to the other.

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* There are cases, in which it may be advisable to amputate below the calf, or even near the ankle. Low down, the operation is frequently performed with a flap.

† Sabatier, Médecine Opératoire, tom. iii. p. 242.

Instead of making a short stump, when the arm must be taken off very high up, Larrey thinks it more advisable to amputate at the shoulder-joint. He says, that, if the humerus is sawn through higher than the insertion of the deltoid muscle, the stump becomes retracted towards the arm-pit by the pectoralis major and latissimus dorsi; the ligatures on the vessels irritate the brachial plexus of nerves: great pain and nervous twitchings are apt to be excited; tetanus is frequently brought on; the stump is affected with considerable swelling; and at length, an anchylosis of the shoulder follows.*

According to the experience of Mr. Guthrie, when amputation is attempted at the insertion of the pectoralis major, the bone will mostly protrude after a few dressings; and, frequently, a disagreeable and painful stump be the consequence. The artery is also liable to retract into the axilla, where it cannot readily be taken up. In cases of this description, instead of amputation at the shoulder-joint, Mr. Guthrie advises the following operation: "Two incisions of a similar shape are to be commenced, one or two finger's breadth below the acromion, as the case may require; the point of the inner one, instead of ceasing, as in the operation of the shoulder, a little below the pectoral muscle, is to be carried directly across the under part to meet the point of the outer incision; so that the under part of the arm is cut by a circular incision, the upper in the same manner as in the operation at the shoulder. These incisions are only through the skin and cellular membrane, which have liberty to retract, but are not to be turned up. The deltoid and pectoralis major are then divided close to the inner incision, and the opposite portion of the deltoid, with the long head of the biceps on the outside, to the extent of the outer incision. A half-circular cut on the under part, in the line of the skin down to the bone, clears it underneath, and shows the artery retracting with its open mouth, which is at this moment advantageously pulled out by a tenaculum, and secured." The flaps are then held asunder, and the bones sawn, &c.†

I should conceive that either this method of operating, or that previously mentioned, which appears to me more simple, ought to be preferred to taking the humerus out of the glenoid cavity, when the nature of the disease or injury does not render it absolutely indispensable.

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* Memoires de Chirurgie Militaire, tom. iii. p. 53., &c.

† Guthrie on Gunshot Wounds, p. 340.

AMPUTATION OF THE FOREARM.

The forearm is to be amputated as low as the case will allow. The tourniquet is to be applied a little above the condyles of the humerus, with its pad on the brachial artery, at the inner edge of the biceps muscle. While one assistant holds the hand, another is to take hold of the forearm, above the place where the first circular wound is to be made. Thus, in conjunction with the former, the latter will be able to fix the limb in a proper manner, and, at the same time, draw up the integuments. After the amputating knife has been carried round the limb, the skin is to be detached from the fascia, a little way upward. The muscles are then to be divided obliquely upwards with the common knife, as long as this will do what is to be done with convenience, and the catling is afterwards to be employed for completing the division of the soft parts, between the radius and ulna. The retractor is to be applied, and the bones sawn, with the hand in the state of pronation.

In general, only four vessels require ligatures, viz. the radial, ulnar, and two interosseous arteries.

Larrey thinks it advantageous to take off the forearm in its fleshy part, notwithstanding the nature of the disease, or injury, would admit of the operation being done towards the wrist. However, as I have amputated several forearms near to the wrist, and the stumps healed in the best way, I see every reason for still adhering to the old good maxim of saving as much of the limb as possible. The cause of the bad success, which many of the French surgeons have had after amputating in the tendinous part of the forearm, has been correctly referred by Mr. Guthrie to their prejudices against the attempt to heal the stump by the first intention.*

In the lower part of the forearm, Mr. Guthrie † prefers making two flaps; a method, which another surgeon ‡ particularly recommends in amputating the more fleshy part of the member below the elbow, I see no reason for deviating in either situation from the ordinary method.

AMPUTATION AT THE SHOULDER JOINT.

The loss of blood is to be prevented, by compressing the subclavian artery, in the way mentioned in the account of high amputations of the arm. With a large common bistoury, a semicircular incision is to be made, with its convexity downward, across the integuments covering the deltoid muscle, about four inches below the acromion.* The skin is not to be detached; but, the surgeon is to proceed immediately to raise the muscle from the bone, quite up to the joint. If the circumflex arteries bleed considerably, they are now to be tied, before the operator proceeds further. Then the surgeon should cut the tendons passing over the joint, and, also, the capsular ligament, so as to be enabled to dislocate the head of the bone. With one stroke of the amputating knife, he is then to divide the skin, muscles, and other parts underneath the joint, and thus complete the separation of the limb. The axillary artery should be instantly taken hold of with the fingers, or forceps, and tied.

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* On Gunshot Wounds of the Extremities, p. 370.

† Ib. p. 372.

‡ Klein's Practische Ansichten der bedeutendsten Chirurgische Operationen, p. 45. 1st. Heft. 4to. Stuttgart, 1816.

The flap of the deltoid muscle is next to be laid down, and its edge will then meet the lower margin of the wound.

The preceding method of operating was first practised by De la Faye, and is one of remarkable simplicity, as I can truly affirm, not only because I have tried it myself, but seen it done on several occasions by other surgeons. The last case, in which I was requested to give my assistance, was a patient of Dr. Blickes', of Walthamstowe: the operation was done as a last resource for a spreading mortification of the arm from external violence; and, though the man survived only about a fortnight, nothing could be more easy than the operation itself, and it was impossible to have had a better stump.

In order to make a flap of the deltoid muscle, some operators prefer first pushing a catling, or long straight double-edged knife, through the muscle near the joint, and, next cutting downwards, they detach as much of the flesh from the bone, as they consider necessary; the flap is then turned up; the tendon of the long head of the biceps divided; and the operation finished, as already described. It was in this manner, that Loder chose to perform the operation.†

Nothing, however, exhibits more strikingly the absurdity of generalizing too much even upon the subject of amputation, than the fact, that excellent as the preceding flap-operation is for the shoulder, the exclusive preference to this method, as declared by some writers, has been made without reflecting, that, in many of the examples in which amputation at the shoulder is indicated, the middle and upper portion of the deltoid muscle is very much lacerated, or more or less of it actually torn away. Under such circumstances, a sufficiency of soft parts for making the flaps must be saved at the anterior and posterior sides of the shoulder; which plan, modified and executed in various ways, is approved of by a considerable number excellent of surgeons, even where circumstances leave a choice of this, or the foregoing method. On the other hand, in certain other cases, there is no possibility of making the flap on each side of the joint. Favourably as I have spoken of the mode of making a single flap of the deltoid, I do not consider it a matter of great importance, whether that operation, or the other above spoken of, be selected, where circumstances offer a choice; for both methods have now been rendered extremely simple and perfect.

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* The horns of the semicircle, if I may use the expression, are to extend upward along the anterior and posterior margin of the deltoid muscle.

† Chirurgisch-Medicinische Beobachtungen, b i. p. 11. 8vo. Weimar, 1794.

As I have explained in the chapter on gun-shot wounds, the necessity for amputation at the shoulder joint may often be removed, and the limb be preserved, by the performance of a less severe and mutilating operation, which consists in merely making an incision for the extraction of the diseased, or splintered head of the humerus, and, if necessary, of the adjoining part of the scapula. The arm is afterwards to be properly supported in a sling, so as to keep the upper end of the humerus as high as possible. It was in an example, where the head of the humerus was diseased, that this judicious practice was first adopted by Mr. White [*]; and Larrey, in the Egyptian campaign, superseded, in not less than ten instances, the necessity of amputating at the shoulder, by the complete and immediate extraction of the head of the humerus, and its splinters. [†]

AMPUTATION OF THE FINGERS AND TOES.

The operation may be done in various ways. Sometimes a small semilunar incision is made on the back of the finger or toe to be amputated, extending across the part with its greatest convexity about half an inch beyond the joint. The flap is next raised, and reflected. The skin on the other side directly opposite the joint, is divided by a second cut, extending across the finger, or toe, and meeting the two ends of the first semilunar incision. The joint is now bent, and the capsular ligament opened. One of the lateral ligaments is then divided, which allows the head of the bone to be dislocated, and the surgeon has nothing more to do, than to cut such other parts, as still attach the part, about to be removed, to the rest of the limb. When the arteries bleed profusely they must be tied; but, in general, the hemorrhage will stop without a ligature, as soon as the flap is applied to the end of the stump, and the edges of the wound have been brought together with adhesive plaster. Of the plan of stopping the bleeding by pinching the vessels, sometimes recommended, I can say nothing from my own experience.

Lisfranc amputates the second, or third phalanx of a finger in the following manner: he bends it, and observes the small lateral fissure in the integuments, directly behind the joint. Here the first incision is made, which lays open the joint, by dividing the integuments and ligaments on the sides and dorsum of the finger, from left to right. In cutting the ligaments at the sides, the edge of the bistoury is directed towards the end of the finger; but, in cutting those on the dorsal side of the joint, it is turned in the opposite direction. The under portion of the capsular ligament is then cut through, and, with the knife directed horizontally, a sufficient flap is made by cutting between the integuments and bone.* When the part cannot be bent, Lisfranc first forms a flap on the palmar side of the finger, by pushing a bistoury through it under the integuments, and cutting forwards and outwards: the operation is then finished nearly in the way of the flap operation sometimes performed in England and already described.

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[*] Cases in Surgery.

[†] Relation Chirurgicale de l'Expedition de l'Armée d'Orient en Egypte, &c. p. 315.

Some surgeons who consider it unnecessary to make a flap, draw the integuments a little up, and then divide them in a circular manner. When the integuments are not diseased, quite enough of them may thus be preserved for covering the bone.

In amputating the metacarpal bone of the thumb, the surgeon should place it in the state of abduction, and make an incision at the mid-point between it and the metacarpal bone of the forefinger. The cut is to be continued down, until the knife touches the os trapezium, when its point is to be turned towards the joint, and the capsular ligament opened. The knife is to be carried through the joint, the head of the bone pressed towards the hand, and a flap formed at the side of the bone, by cutting in the direction away from the trapezium.†

A formal dissection of the metacarpal bones of the fingers, away from their articular connexion with the carpus, is now rarely performed, because they may always be easily cut through at any point with Mr. Liston's bone-nippers.

When it is necessary to remove the metatarsal bone of the great, or little toe, it is better to saw off the diseased portion, than to cut into the joints of the tarsus. Sufficient skin should be saved for covering the bone, and when the saw is used, the adjoining soft parts must be defended from injury by a piece of pasteboard, placed between them and the teeth of the instrument. The division of the bone may also be very conveniently performed with Mr. Liston's bone-nippers.

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* See Averill's Operative Surgery, p. 111.

† Op. cit. p. 115.

CHAP. LVIII.

PARONYCHIA, OR WHITLOW,

Is a very painful inflammation at the extremity of one of the fingers, or at the root, or sides, of the nail, slowly, but almost certainly, terminating in the formation of an abscess. Frequently, it extends gradually upwards to the hand, or even the wrist. I believe the varieties of whitlow are all referrible either to their depth, their extent, or their violence, some allowance being made for the effect of the patient's state of health upon the local disease. The generality of writers notice four kinds of whitlow; the first is situated under the cuticle, near the root, or side of the nail; the second, in the cellular membrane under the cutis; the third, in the sheath of the flexor tendons; and the fourth, between the periosteum and bone. In severe cases, the throbbing of the arteries extends a considerable way up the arm, and the febrile symptoms run high; particularly, when the abscess passes extensively up the limb, along the sheaths of the flexor tendons.

In ordinary cases, as Dr. Gibson has observed, a pungent, deep-seated pain is felt in the end of the finger, soon followed by considerable swelling. The pain increases with great rapidity, and in a little time becomes so intolerable, that the patient is sometimes kept awake by it for whole days and nights together. Even delirium and death have been known to be caused by this apparently trivial complaint. Although the progress of the inflammation is rapid, the suppurative process is so slow, that a long time frequently elapses before a fluctuation can be perceived, and, even after matter is formed, it is so confined by fasciæ and tendinous sheaths, that it cannot make its way to the surface. Hence, it spreads extensively and deeply; the bones often suffer necrosis; and the tendons and muscles are separated from each other, and completely undermined. Sometimes, the ravages of the disease do not extend beyond a single phalanx; at other times, the whole finger is destroyed, and several of the contiguous joints in succession.*

Whitlows frequently originate from external causes; as bruises, pricks of needles, the lodgment of thorns, or bits of broken glass, &c., but, still more commonly, the inflammation takes place without any manifest cause. Whitlows are considerably more frequent in young persons than adults; yet, some grown up, and even elderly persons seem peculiarly liable to these troublesome abscesses. These facts, clearly imply the possibility of a certain state of the constitution having a share in the production of the local complaint.

The formation of matter in cases of whitlow, though generally unavoidable, is not productive of relief; but, on the contrary, the patient's sufferings are greatly increased by its accumulation and confinement. The aim to promote suppuration, therefore, is only right, on the principle of bringing the case to that state, in which speedy relief may be afforded by opening the abscess. The extent and violence of whitlows may be checked by applying to the part affected, in the early stage of the complaint, leeches, and astringent applications, and having recourse to other antiphlogistic means. In severe cases, where the swelling reaches up to the arm, and the fever is considerable, venesection should be freely practised, aperient medicines given, opium exhibited, cold lotions applied, and leeches repeatedly used. Brandy, ether, camphorated spirit of wine, ice, camphorated oil, vinegar, linseed oil, and soft soap, have been recommended as good applications to whitlows, previously to suppuration, and as even capable of sometimes bringing about resolution. In particular, early and repeated blistering of the inflamed part is said frequently to have had the latter effect.* When these plans fail, and the increase of the swelling and pain denotes the impossibility of preventing an abscess, poultices and fomentations are to be employed, until the matter admits of being discharged by a free incision, which is the principal means of relief, and ought to be practised as soon as the existence of the abscess is ascertained. When the inflammation is somewhat abated, common dressings are to be substituted for poultices, which, if continued too long, do harm by relaxing the sore, and thickening the cuticle. Sometimes, the cure requires the removal of the nail, or of dead portions of bone; and sometimes the application of lunar caustic, or strong stimulating dressings, to repress fungous granulations, or convert the unhealthy sluggish action of the sore into a process favourable to cicatrization. Equal parts of balsam of copaiba and tincture of opium, have been recommended.

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* See Gibson's Institutes, &c. of Surgery, vol. i. p. 223.

CHAP. LIX.

VENESECTION.

In whatever part of the body venesection is to be practised, it is necessary to make pressure on the vein, betwixt the place where the puncture is to be made, and the heart. Thus the return of blood through the vessel is prevented; consequently it swells, becomes conspicuous, and bleeds freely, which it would not do if the blood could readily pass on towards the heart.

In bleeding in the arm, a fillet, or bandage, is to be tied, with moderate tightness, round the limb, a little above the elbow, to intercept the passage of the blood through all the superficial veins, without obstructing the circulation through the artery, which would evidently prevent the veins from being rendered turgid.

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* Vol. cit. p. 225.

The surgeon, before putting a ligature round the arm, should ascertain precisely the situation of the pulsation of the artery, and, if equally convenient, he should not open the vein immediately over it. It is also proper to attend to the situation of a pulsation, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial high up; and, in this case, it frequently proceeds superficially over the muscles, arising from the internal condyle, instead of diving under them, in the ordinary manner.

In general, it is best to select a vein which rolls least under the skin. Such a vessel, though sometimes less superficial than another, may be more easily opened. However, the operator is always to fix the vein, as much as he can, by placing the thumb of his left hand a little below the place where he intends to introduce the lancet.

More depends on the mode of using this instrument, than on its shape. It should be pushed into the vein in an oblique direction, and, when its point is a little within the cavity of the vessel, it is not to be introduced further, but the opening is to be rendered sufficiently large, by carrying the front edge of the lancet obliquely forward and upward, by which movement it is also brought out of the part again. In cases of herniæ, dislocations, &c. it is often a great desideratum to make a free opening, in order that the sudden evacuation of blood may make the patient faint. The puncture being made, the patient is to support his arm, in a convenient position for allowing the blood to flow into a basin, by taking hold of a stick, which he may turn round and round in his hand, in order to put the muscles into action, and make the blood flow out in a freer current. Sometimes, however, it escapes so readily, that there is no occasion for the muscles of the arm to be exerted. When the patient is so circumstanced, that he cannot keep his arm in the right position himself, the surgeon, or assistant, is to support the arm; and, if the vein should not bleed freely, he is to desire the patient to take hold of any small body, and move it about in his hand, so as to to put the muscles of the fore-arm into action.

The due quantity of blood having been taken away, the ligature is to be loosened, and removed. The stream of blood now generally ceases, and always does so, when the surgeon places the thumb of his left hand just below the orifice. The arm in this state is to be washed with a sponge, and dried. The edges of the wound are to be placed in contact, and kept so by a small compress of lint, which is to be bound on the part, by applying the bleeding fillet round the arm, in the form of a figure of eight. The bandage is to meet and cross in front, exactly over the dossil of lint.

When the external jugular vein is opened, the surgeon makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle and the vein is less apt to glide out of the way, when the surgeon opens the vessel, just where it lies over some part of the sterno-cleido-mastoideus.

The temporal artery, and its branches, are the only vessels, in which surgeons now ever perform arteriotomy. When the branch is superficial, it may be punctured at once; but, in other cases, it is best first to make a small incision through the integuments. After the due quantity of blood has been taken away, the bleeding may usually be stopped, by means of a roller and compress. When the hemorrhage after the operation proves troublesome, some surgeons recommend cutting the vessel completely across, in order that it may retract.

CHAP. LX.

PARTICULAR FRACTURES.

FRACTURE OF THE OSSA NASI.

The lower portion of these bones being most exposed to violence, is most liable to be broken. The two bones are not always fractured together: sometimes one is broken all across, while the other, without having suffered any solution of continuity, is either elevated or depressed. Falls, or blows on the face, are the usual causes of the accident, and hence, the soft parts are generally at the same time either very much contused, or wounded. These cases are often attended with a fracture of the perpendicular lamella of the os ethmoides, which process is thrown more or less to one side or the other. The accident is commonly followed by inflammation of the pituitary membrane; swelling of the nose and adjoining parts of the face; ophthalmy; and a great deal of hemorrhage from the nostrils, through which the breathing is more or less obstructed. The blow, which breaks the ossa nasi, may also produce a concussion of the brain; an extravasation of blood within the cranium; or, if we can believe some accounts, pressure on the brain, from the crista galli being driven inward.

The displaced portions of bone are to be raised, or depressed, to their proper level, by introducing a strong probe, or female catheter, up the nostril, and moving the pieces of bone into their proper position, by means of the combined operation of the probe, or catheter, on the inside, and of the fingers, on the outside of the nose. If the perpendicular process of the os ethmoides should be forced to one side, it is to be replaced with a probe, as well as circumstances will allow. If the crista galli were driven inward, so as to press upon the brain, the surgeon might gently endeavour to draw down the vomer and perpendicular lamella of the ethmoid bone, by means of a director, passed up into each nostril. I believe, with Delpech, that such a case is very uncommon, and that when the brain is injured, it is generally, not from any displacement of the crista galli, but from the concussion or blow itself.

The ossa nasi, when duly replaced, are not liable to be drawn out of their proper situation by the action of any muscles. When the broken pieces have a propensity to fall inwards, some authors talk of supporting them by dossils of lint, smeared with any softening ointment, and introduced up the nostrils, or of employing tubes with a similar intention: but all practical surgeons consider these contrivances more likely to cause irritation, than be of any real service. The indications, therefore, must be limited to some discutient application, and general antiphlogistic remedies.

FRACTURES OF THE LOWER JAW-BONE.

This bone may be fractured either in its body, or rami, on one side or both; at the neck of one of the condyles, or near the symphysis. According to Delpech, the fracture is never situated exactly at the symphysis itself; but this remark is incorrect, with respect to children; and it has been noticed in one instance in a man beyond forty years of age.* The injury may be either a single solution of continuity, or a comminuted fracture, that is to say, a case, in which the bone is broken into several pieces.

Fractures of the jaw admit very well of a general division into those which occur between the symphysis of the bone and the insertion of the masseter, and which may be called fractures of the chin; those, which happen at some point between the same insertion and the coronoid process, and which may be termed fractures of the angle; and others affecting the neck of the condyle.

As the lower jaw-bone is strong and moveable, it cannot be broken without a good deal of violence, traces of which are almost always left in the soft parts.

When the fracture is towards the chin, whether the bone be broken on one side, or both, the fragment, comprehending the symphysis, is drawn downwards. If the fracture extend obliquely downwards and backwards, this sort of displacement is very considerable.

On the other hand, both sides of the lower jaw between the insertion of the masseter, and the angle of the bone, as well as the coronoid process itself, are covered by muscular attachments. Hence, fractures in this extent of the bone, are liable to little displacement, the pterygoid, temporal, and masseter muscles here opposing the tendency of the digastric and other muscles to draw down the part of it in front of the fracture.

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* See Operative Surgery by C. Bell, vol. ii. p. 219. 8vo. London. 1809. Gibson's Institutes, vol. i. p. 381.

When the neck of the condyle is fractured, the condyle itself may be displaced forwards by the action of the external pterygoid muscle.*

A fracture of the lower jaw may be detected by introducing a finger into the mouth, and pressing on the front teeth of the side on which the fracture is supposed to be, while the fingers of the other hand are applied to the basis of the bone, near the angle. On making alternate pressure in these situations, the bone may be felt to move, and a crepitus be distinguished. This painful mode of examination, however, is not invariably requisite; for, when the fracture is displaced, the nature of the accident is rendered manifest by the body of the bone being drawn down from the rami; the mouth being more or less open, and so distorted that the commissure of the lips is much lower on the injured side than the other; while the front teeth are below the level of the molares; and the regularity of the arch, formed by the teeth and alveolary process, destroyed.

When the fracture is not displaced, the surgeon need only adapt some pasteboard, wet and softened with vinegar, to the outside of the jaw, both along its side, and under its basis. Over this wet pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, the two back tails pinned to the front of his night-cap, and the two anterior to the back of it. When the pasteboard becomes dry, it forms a convenient apparatus for supporting the fracture.

When the symphysis is drawn below the level of the base of the jaw behind the fracture, the coronoid process is to be gradually pushed backward with the fore-finger of one hand, while the fore and middle fingers of the other hand are to be applied to the front teeth, and the thumb to the basis of the anterior part of the jaw. At the moment when the coronoid process is pushed backwards, the front portion of the bone is to be raised and inclined forwards. When one end of the fracture is situated over the other, the two parts of the bone are to be pushed in opposite directions, and if this be skilfully done, the slightest pressure on the extremities of the fracture will suffice for placing them in contact.

That the fracture is well reduced, may always be readily known by adverting to the evenness of the dental line, and that of the base of the jaw.

When any teeth are driven out of their sockets, they should be immediately introduced again, and, if necessary, tied to the adjoining teeth, by means of a piece of catgut, or gold wire. However, when the displaced tooth belongs to the very situation at which the fracture has occurred, it is generally thought most advisable to remove it altogether.

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* Delpech, Précis des Mal. Chir. t. i. pp. 232—235.

The surfaces of the fracture having been placed in even contact, the jaw is to be covered with pasteboard, and the four-tailed bandage applied. It will also be necessary to counteract the action of muscles, between the lower jaw and os hyoides, by supporting the front portion of the bone with compresses placed under the bandage.

In the treatment of these cases, I have not found it necessary to interpose any substance between the teeth; a method also represented by Gibson as needless.* Several practitioners recommend this plan for various, and (as they suppose) good reasons. Thus a modern writer observes, " if the teeth be very regular, and those of the upper and lower jaw correspond, those of the upper jaw serve the purpose of secure splints, when the base of the jaw and chin are bandaged. If the patient has lost a tooth previously, and when the pieces of the broken jaw are brought together, there is a deficiency or irregularity in the teeth, then a piece of cork may be adapted to the teeth of each side, in such a manner as to serve the purpose of a splint." † Here the intervention of cork is approved of, on the principle of its affording an even surface, against which the line of teeth in the lower jaw may rest. And as Mr. Bell thus advises the practice when the teeth are defective and irregular, and in the next page, when they are so perfect, as to leave no interstice through which the food can be put into the mouth, he is to be considered as an advocate for this method in all cases.

When the neck of the condyle is broken, little more can be done, than keeping the bone steadily supported with a four-tailed bandage. The extreme part of the condyle, after separation from the rest of the bone, has sometimes been destroyed by necrosis.

Sometimes the artery, running in the canalis mentalis, is ruptured, and the hemorrhage copious. I have never seen a case, however, in which the bleeding did not cease as soon as the surfaces of the fracture were placed in contact.

The patient must avoid talking, and keep the jaw as quiet as possible. His food should be soft, so as not to require mastication, and it ought to be put into his mouth with a small tea-spoon. In very bad cases, all nourishment and medicines might be introduced into the stomach through an elastic catheter passed through one of the nostrils, by which means the hurtful movement of deglutition would be avoided.

The lower jaw-bone being highly vascular, its injuries are generally repaired with surprising quickness. In adults, three weeks commonly suffice for the union of its fractures; and in children, a fortnight. In compound, or comminuted fractures, however, necrosis of large portions of the bone sometimes ensues, and the exfoliations take up considerable time. Sometimes, after fractures of the chin, various nervous symptoms, and paralysis of certain muscles of the face, are the consequence, owing to injury done to the inferior maxillary nerve. In one case where the patient had been carried off by fever, delirium, convulsions, &c. Flajani dissected the parts, and found the nerve lacerated just at its exit from the canalis mentalis.*

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* Institutes of Surgery, vol. ii. p. 384.

† Operative Surgery, vol. ii. p. 221. 8vo. Lond. 1809.

FRACTURE OF THE CLAVICLE.

The exposed situation, and natural slenderness of this bone, render it very liable to be broken, either at its middle, its sternal, or its scapular extremity. Its middle part, however, where its curvature is greatest, most frequently suffers.

Fractures of the clavicle, besides being oblique, or transverse, may be divided into two different kinds, according as they happen to be situated at some point between the coracoid process of the scapula and the sternal extremity of the clavicle; or more towards the scapular end of the bone.

The first case is most frequently the consequence of a fall upon the outer part of the shoulder, or upon the palm of the hand; for, the clavicle receives the impulse of every force, applied to the upper extremity. The second case is generally produced by a blow inflicted directly on the part, and is attended with little displacement. On the contrary, in the other example, the displacement is very conspicuous; being caused by the weight of the arm, and the action of the pectoralis major and latissimus dorsi. Hence, the shoulder is depressed and drawn nearer to the trunk; the arm falls downwards and inwards; and the inner end of the fracture projects, partly in consequence of the action of the sterno-cleido-mastoideus, but chiefly from the descent of the external portion of the bone below it, in the direction downwards, inwards, and forwards.

Fractures of the clavicle are not commonly attended with any bad symptoms, arising from the injury of the neighbouring parts by the fragments of bone: at least, the cause is generally exempt from any evils of this kind, when the accident has been produced by some force applied to the arm, or outer part of the shoulder. When, however, the violence has been directed immediately against the bone, and has had a share in increasing the displacement of the fragments, the external portion may be forced against the axillary vessels and nerves; its point be driven through the integuments; or a spicula prick the lungs, so as to produce emphysema.

The symptoms of a broken clavicle are, pain at the injured part; impossibility of raising the hand to the head; the hanging of the arm close to the side, rotated inwards; the fall of the shoulder and its inclination towards the median line of the body; the tendency of the head towards the injured shoulder; the patient's supporting the weight of his arm with his other hand; the projection of the internal fragment upwards and backwards; the situation of the external one below it, directed downwards and forwards; the restoration of the natural position of the shoulder by taking hold of the upper part of the humerus, and carrying it upwards, backwards, and outwards, which manœuvre also puts the ends of the fracture in due contact, and sometimes produces a crepitus; and lastly, the return of the displacement immediately the arm is left unsupported.

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* Flajani, Collezione d'Osservazione e Riflessioni di Chirurgia, tomo iii. p. 167. Roma, 1802.

In the treatment, the indications are to keep the shoulder elevated, inclined away from the trunk, and, at the same time, drawn backwards. Indeed, as the extremity of the internal fragment is is pulled somewhat upwards by the sterno-cleido-mastoideus, the shoulder should be raised even higher than natural. The apparatus should completely take off the weight of the arm, and continually act with an equal force, so as to keep the shoulder regularly in one position; while the parts, with which the clavicle is articulated should be kept perfectly motionless.*

It must be acknowledged, that the completion of all these objects is attended with considerable difficulty. However, the plan adopted by Desault fulfils each indication nearer than any other method hitherto devised, and, consequently, ought to be preferred to the common practice of our hospitals.

In these, the principal reliance is placed upon the effect of a sling for supporting the arm, and upon a figure-of-eight bandage, with which the shoulders are braced back, a bit of soap-plaster being usually applied over the fracture under the bandage, and some tow, or other soft materials, interposed between the margins of the axillæ and the turns of the roller, in order to prevent chafing. An assistant is first directed to draw the shoulders firmly back, while another assistant keeps the arm and shoulder steadily raised. The surgeon then examines, whether the ends of the fracture are brought together, and if they appear to be so, he applies the piece of soap-plaster to the skin over the fracture, and then the figure-of-eight bandage. Lastly, the elbow and forearm are supported in a sling.

The figure-of-eight bandage is not altogether well calculated for fractures of the clavicle, particularly such as are attended with displacement. The outer portion of the bone is thrown downward and forward, and is already situated too much inward, in which latter direction the bandage must push it still further. Hence, the advantage of placing a thick wedge-shaped cushion just under the arm-pit, with its broad end upwards, and keeping the elbow closely confined by the side of the body, in the manner practised by Desault.

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* Delpech, Précis des Maladies Chir. t. i. p. 248.

FRACTURES OF THE SCAPULA.

When the acromion is broken, the solution of continuity mostly happens across its base. The external fragment is drawn downwards by the weight of the arm, through the medium of the deltoid muscle. The displacement, however, is not very considerable, amounting merely to a simple inclination of the point of the bone downwards; a change, which may be rectified either by raising the arm from the trunk, or elevating it in a parallel line to its axis. The head of the humerus sinks towards the axilla, as far as the capsular ligament will permit, part of the attachment of the deltoid being broken off. The distance between the extremity of the shoulder and the sternal end of the clavicle is diminished; a depression is felt just where the fracture is situated; and a crepitus is manifest when the head of the humerus is pushed up, and rotated.*

The treatment of fractures of the acromion consists in keeping the humerus close to the side, raised in a line parallel to its axis. Between the arm and the side a cushion, thicker below than above, should be interposed, because a close approximation of the elbow to the body has a tendency to bring on a displacement of the outer fragment of the bone, by rendering the deltoid muscle tense. The head of the humerus should be kept well up against the acromion by means of a good sling, and a bandage, extending from the elbow on the injured side over the opposite shoulder. Delpech prefers keeping the patient quiet in bed, with the arm considerably raised on a pillow, so as to relax the deltoid; in which state, he conceives, that the fibres of the trapezius would act usefully in bringing up the outer piece of bone to a level with the clavicle.† Fractures of the acromion most frequently unite by ligament.

A fracture of the neck of the scapula is very liable to be mistaken for a dislocation; for the glenoid cavity, being separated from the rest of the bone, falls towards the axilla, and with it the head of the humerus; the fulness of the deltoid is lost; a vacancy is felt under the acromion; and the head of the humerus is perceptible in the arm-pit. The nature of the case may be known by the facility of replacing the parts; their immediate descent again, when left to themselves; and the crepitus felt on touching the coracoid process, and rotating the humerus.‡ The best plan of treatment is to maintain the arm and shoulder well up, and to put a thick compress in the axilla so as to keep the head of the humerus outwards, the elbow being confined close to the side with a bandage. In short,

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* See Sir A. Cooper on Dislocations, p. 418. ed. 4.

† Traité des Maladies Chir. t. i. p. 242.

‡ Sir A. Cooper, op. cit. p. 421.

Desault's method of curing fractures of the clavicle is here perfectly applicable.

Fractures of the body of the scapula are treated by keeping the arm perfectly quiet, applying a sling and the spica bandage, and having recourse to means for lessening the effects of the contusion of the soft parts. When the lower angle of the scapula is broken off, the action of the serratus major anticus in displacing it, is difficult to counteract. A thick compress, however, may be bound just in front of the fragment, and the motions of the arm are to be prevented with a sling or bandage.*

In fractures of the coracoid process, the coraco-brachialis muscle should be relaxed, as a tense state of it would increase the displacement of the fragment. The humerus should therefore be inclined towards the sternum, and confined in this situation with a sling and a roller.

The spica bandage, sometimes employed in fractures of the scapula, is used rather for its neat appearance, than real efficacy. The middle of a double-headed roller is put under the arm-pit of the sound side; the ends are then carried obliquely upwards over the breast and back to the injured shoulder, where they are to cross. They next cross under the subjacent arm-pit, whence they ascend to the top of the shoulder, and again crossing, follow the course already mentioned over the back, breast, and shoulder, once or twice more, the application being generally finished by a turn or two round the chest, including the arm, or not, as the circumstances of the case may require. In injuries of the scapula, this last proceeding of including the arm, and thus confining it close to the side, is the most useful operation of the spica bandage.

FRACTURES OF THE STERNUM.

The sternum being suspended, as it were, between the elastic cartilages of the ribs, cannot be easily broken: the accident is sometimes produced by violent blows, or the passage of the wheel of a carriage over the chest. When the bone is fractured, the thoracic viscera also generally suffer more or less injury. In some cases, the fracture consists of a single fissure; in others, the bone is broken in several places; and the fragments may be displaced by the same force which caused the injury.

Fractures of the sternum are most frequently transverse, and as its lower part, and the inferior ribs attached to it have the greatest degree of motion, the lower fragment is often displaced, and, being propelled forwards in inspiration, projects more than the upper one, and even overlaps it.

As the sternum is very superficial, its fractures are readily detected by manual examination; and, when the pieces are at all separated, the deformity is quite obvious. Respiration sometimes produces a crepitus, which the patient is conscious of himself, and the surgeon can easily perceive. A fixed pain is also experienced in the part, and is exasperated by the movements of breathing; while, in consequence either of the displacement of the fragments, or the contusion of the internal organs, the patient suffers great oppression, palpitations, and a troublesome cough. When the lungs are wounded by spiculæ of depressed bone, the patient coughs up blood, and emphysema may follow.*

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* Gibson's Institutes, vol. i. p. 406.

When a fracture of the sternum is attended with a depression of the bone, the urgent symptoms, thus produced, may require a prompt elevation of the part beaten inward. In this case, some writers recommend a considerable extension of the spine, by placing under the patient's loins a thick pillow. When this method fails, an incision is advised to be made down to the bone; and, if the depressed portion of it cannot be raised by means of an elevator, or the forceps, it is to be removed either with a trephine, or one of Mr. Hey's saws. Delpech conceives, that the employment of saws will scarcely ever be necessary, as the soft spongy texture of the bone would make it easy for the surgeon to cut, or scrape away a part of the anterior fragment.

Fractures of the sternum being mostly complicated with injury of the thoracic viscera, are attended with risk of extravasation of blood in the chest, emphysema, inflammation of the lungs, abscesses in the anterior mediastinum, or necrosis of the injured bone itself. It is these latter effects, viz. abscesses and exfoliations, which more frequently call for the use of the trephine, than mere depressions of the bone.

If any cases in surgery demand copious venesection, fractures of the sternum, and injuries of the thoracic viscera, will be allowed to do so; indeed the lancet should be used freely and repeatedly, according to the urgency of the symptoms; other antiphlogistic measures being also rigorously practised.

With respect to an apparatus for diminishing the movements of the ribs and broken sternum, the best is a broad roller tightly applied, or a strong napkin well-laced round the chest.

FRACTURES OF THE RIBS.

The upper ribs are not often broken, on account of their guarded situation beneath the clavicle and shoulder; while the false ribs are seldom fractured, because by their great moveableness they elude the effect of external violence. The middle ribs are most frequently broken. When the force is applied by a broad surface, it is not uncommon for two or three of the ribs to be fractured. These injuries are rarely attended with any material displacement, the intercostal muscles tending to hinder a permanent separation of the fragments. The bone mostly breaks at its greatest convexity. The surgeon should place his hand on the part of the chest where a pricking pain is complained of, or where the blow has been received; and then the patient should be desired to cough, in which action the ribs undergo a sudden motion, and a crepitus is rendered perceptible. However, all the best practical surgeons are in the habit of adopting the same treatment when there is reason to suspect a rib to be fractured, as when the injury is positively known to exist, by a crepitus, or an irregularity of the bone.

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* Flajani, Collezione d'Osservazioni di Chirurgia, t. iii. p. 214.

When the point of a fractured rib is forced inward, extravasation of blood, emphysema, and inflammation of the pleura and lungs may be the consequences.

In the treatment, the principal indication is to render the injured bone or bones as motionless as possible. For this purpose, a broad roller is put tightly round the thorax, or a piece of strong linen, sufficiently large, is firmly laced round it. The patient should then be bled, and other antiphlogistic remedies adopted. If much cough prevail, the spermaceti mixture, with opium, may be exhibited.

The cartilages of the ribs are subject to fracture; and what is remarkable, the union is never effected through the medium either of a cartilaginous or any other soft substance, but of an osseous matter.* The treatment is the same as that of a fractured rib.

FRACTURES OF THE VERTEBRÆ.

One or more of the spinous processes are sometimes broken, without the spinal marrow receiving any particular injury; but, other fractures of the spine are mostly attended with a train of dangerous symptoms, all the parts situated below the injured point being generally affected with partial or complete paralysis. As Mr. C. Bell observes, when the fracture is low, it is attended with loss of sensibility and motion in the lower extremities, and paralytic disorder of the bladder; when the injury is higher up, the abdomen becomes enormously distended with air collected in the bowels; when it is still higher, respiration is affected; and, when it is above the principal origin of the phrenic nerve, the breathing is stopped, and death suddenly follows.† With the exception of the spinous processes, the several parts of the vertebræ are so protected by their deep situation, that they cannot be broken without the application of immense violence, and hence the fracture is mostly accompanied with other injuries of quite a different nature, and sometimes even quite as surely fatal. Experience proves, indeed, that when the spine is broken, the accident is generally produced by the patient falling from a very considerable height, and the backbone striking with vast force against some hard projecting body.

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* Delpech, Traité des Maladies Chir, t. i. p. 238.

† Surgical Obs. vol. i. p. 150.

The violence not only breaks the vertebræ, and causes injury of the spinal marrow, but gives rise to a copious extravasation of blood in the cellular membrane, and even within the cavity of the abdomen, from rupture of the spleen, kidney, or other viscera.*

If a fracture with displacement be below the fourth cervical vertebra, the functions of that nerve, the action of the diaphragm, and the breathing are not abolished, so that life is not always immediately destroyed, unless additional mischief be done to other important organs. If the lumbar vertebræ be displaced, the lower extremities are so completely insensible, that they may be pinched, or burnt, without the patient being conscious of it, and the power of volition over the muscles is annihilated. The sphincter ani is paralytic, and the feces are involuntarily discharged. The bladder cannot contract, and the urine cannot be voided, without a catheter. The patient mostly dies in a month, or six weeks; but may live a considerable time, and ultimately perish of gangrene of the nates. †

In cases of fracture and displacement of the dorsal vertebræ, the paralysis extends higher, and the abdomen becomes excessively distended with air. The patient rarely lives longer than two or three weeks; but Sir Astley Cooper saw one case where death did not happen till nine months after the accident.

Fractures of the cervical vertebræ, below the origin of the phrenic nerve, cause more or less paralysis of the arms, as well as of the lower parts of the body. The breathing is difficult, the intercostal muscles being paralytic. Great distention of the belly with air, inability to discharge the urine, or to retain the feces, occur, as in fractures of the dorsal vertebræ. Death generally follows between the third and seventh day.

On dissection, the spinous process of the displaced vertebra is found depressed, the body of the bone broken through, (rarely dislocated by laceration of the intervertebral substance) and projecting more or less forwards. Blood is extravasated between the vertebræ and sheath of the spinal marrow, and frequently on the latter part itself. In slight displacements, the spinal marrow is compressed and bruised; in considerable ones, it is generally torn through by the bony arch of the spinous processes, but the dura mater remains entire. ‡

Here I am disposed to think with a modern writer, that an incision through the skin and muscles covering the spine, and the withdrawing of a portion of the circle of bone which surrounds the marrow, would be inevitably fatal. § Where the patient is not quickly destroyed by the paralysis induced in the diaphragm and other important organs, or by the case being complicated with rupture of the kidnies, spleen, &c. and internal hemorrhage, I know of no treatment which holds out any prospect of efficacy, except the free use of general and topical bleeding, with a view of preventing inflammation, and suppuration within the spinal canal. Other antiphlogistic means will also be necessary, and above all things, the patient must be kept perfectly quiet in one position. The difficulty of voiding the urine is to be obviated by the catheter. Should the patient live long enough to justify the inference, that the fracture is united, though some of the paralytic effects of the injury still remain, stimulating liniments, blisters, and issues * may be tried.

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* See the fatal case recorded by Flajani, Collezione d'Osservazioni di Chirurgia, tom. ii. p.231.

† See Sir A. Cooper on Dislocations, p. 510. ed. 4.

‡ Sir A. Cooper, op. cit. p. 513.

§ C. Bell, vol. cit. p. 156.

FRACTURES OF THE PELVIS.

On account of the great strength, and deep situation of the bones of the pelvis, they are seldom fractured, and when they are, the violence is so considerable, that vast mischief is done both to the external soft parts, and the internal viscera.

The upper part of the os sacrum can rarely be broken, on account of its remarkable thickness; but, by great violence, it is sometimes disjointed from the ilium.

Thei lium is more liable to fracture than any other bone of the pelvis. The rami of the ischium and pubes are also occasionally broken. Fractures of the os innominatum may be mistaken for dislocations of the thigh-bone; for, as Sir Astley Cooper remarks, when the injury extends through the acetabulum, the head of the os femoris is drawn upwards, and the trochanter somewhat forwards, so that the leg is shortened, and the knee and foot are turned inwards. If the os innominatum is disjointed from the sacrum, and the ossa pubis and ischium are broken, the limb is slightly shortened; but the knee and foot are not turned inwards. Such fractures may be known by a crepitus, which is felt on applying the hand to the crista of the ilium, and moving the thigh, which is less fixed than in a dislocation. In one example of fracture of the acetabulum, the head of the thigh-bone had sunk deep into the cavity of the pelvis. †

The pressure of the pelvis between a cart-wheel and a wall; the passage of a heavy waggon over it; falls from great heights against very hard bodies; and gunshot violence‡, are the ordinary causes of fractures of the pelvis. In some cases, the bladder is ruptured, and the urine effused, so as occasionally to be the cause of a fatal inflammation of the bowels and peritonæum.

In most cases, the fragments are not displaced, and of course

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* C. Bell, vol. cit. p. 160.

† Surgical Essays, part i. pp. 49—51., and Treatise on Dislocations, pp. 94—97. ed. 4.

‡ In the neighbourhood of Antwerp, I saw a case, in which the explosion of a shell broke the tuberosities and rami of the ischium, dreadfully mangled the soft parts, and fractured one of the thighs. The unfortunate patient, who was a private in the Guards, did not survive this dreadful injury more than twenty minutes. I have since seen another bad fracture of the pelvis, where the injury of the viscera, by the passage of a heavy waggon over it, caused death in about half an hour.

no reduction is needed. Some surgeons apply a roller round the pelvis; others dispense with it. Rest, copious bleeding, fomentations, low diet, and every thing, calculated to prevent inflammation within the pelvis and abdomen, are to be rigorously put in practice. Here the ingenious beds, devised for the purpose of enabling patients to empty the bowels, without any disturbance or change of posture, cannot be too much commended.

In most fractures of the pelvis, where the injury of other parts is not such as to destroy life in a very short time, the use of the catheter is indispensable. As the lower extremities are often paralytic, and the patient subjected to long confinement in nearly the same posture, too much care cannot be taken to prevent gangrene of the parts of the body on which he lies.

FRACTURES OF THE HUMERUS

Are distinguished, first into those which happen above the insertion of the deltoid muscle; secondly, into those which occur below that point; and thirdly, into others situated towards the lower end of the bone.

Fractures of the portion of the humerus, just below its tubercles, happen both in old and in young persons, but rarely in those of middle age. In the young, the epiphysis separates from the shaft of the bone. In either case, the upper fragment is drawn outwards by the action of the subscapularis and teres minor, while the lower one is pulled inwards by the latissimus dorsi and pectoralis major. At the same time, the weight of the arm, keeping down the lower fragment, prevents it from overlapping the upper.* Sir Astley Cooper has recorded the particulars of an interesting case, in which the neck of the humerus was fractured within the capsular ligament, the tubercles remaining attached to the body of the bone; the union which followed was ligamentous.† Fractures of the upper part of the bone should be carefully discriminated from dislocations: when fractured, the head of the bone still remains in the glenoid cavity, but the shaft sinks into the axilla, where its extremity can be felt, and it draws down the deltoid muscle, so as to lessen the roundness of the shoulder. In a luxation, a hollow may always be felt under the acromion, and the head of the bone in the axilla, or under the pectoral muscle. In one case, a crepitus occurs; in the other, this symptom is absent.

The middle of the humerus is more frequently broken than any other part of it; and the nature of the case is rendered sufficiently plain by the flexibility of the limb in the situation of the fracture, the angular deformity, and the crepitus, which is always readily perceived.

The condyles of the humerus are sometimes obliquely broken off, just above the joint, and the accident may be mistaken for a dislocation of the radius and ulna backwards; from which case, however, it may be distinguished by the crepitus felt on rotating the radius, and by the immediate return of the displacement after the reduction.*

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* Gibson's Institutes, &c. vol. i. p. 407.

† On Dislocations, p. 411. ed. 4.

An oblique fracture sometimes detaches the internal condyle from the rest of the bone. The ulna appears dislocated from it, and, when the arm is extended, the condyle projects behind the humerus. When the arm is bent, the ulna resumes its natural situation. When the condyles are grasped, and the forearm bent and extended, a crepitus is felt at the inner condyle. Lastly, when the arm is extended, the lower end of the humerus advances upon the ulna. According to Sir Astley Cooper, from whom the foregoing particulars are borrowed, this accident is caused by a fall upon the elbow, and is most common in youth, before the epiphysis is perfectly ossified; but, he has seen it in old subjects. It is frequently mistaken for a dislocation.

Fractures of the external condyle are attended with a crepitus, during the rotation of the radius, and great difficulty of moving the elbow joint. When the portion broken off is large, it is displaced a little backwards, and the radius with it. The case is most frequently seen in children. Preparations in the museum at St. Thomas's hospital represent an union by means of a ligamentous substance. †

Fractures of the head and neck of the humerus, or of any part of it above the insertions of the great pectoral and latissimus dorsi muscles, are treated in the following manner: a roller is first to be applied from the elbow to the shoulder; a splint is then to be placed on the external side of the humerus, and a wedge-shaped cushion on its inner side with the broad part upwards, or close to the axilla. By continuing the application of the rest of the roller downwards, the apparatus is fixed. The forearm is then to be supported in a sling, without the elbow being too much pushed upwards. The cushion near the arm-pit keeps the fracture steady far better than a splint, which here would have little power over the upper part of the bone.

When the middle portion of the humerus is broken, the forearm is to be bent, so as to relax the biceps, and gentle extension made by an assistant, who at once draws the lower portion of the bone downward, and supports the forearm, while the surgeon applies a piece of soap plaster, and a roller. The outer splint is to extend from the acromion to the outer condyle, and to be lined with a soft pad. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is also to be lined with a pad of tow, or other soft materials. Some surgeons are content with the application of two splints; but, though the two above described are the essential ones, yet, as the cylindrical form of the arm conveniently allows it to be quite enclosed in splints, I see no objection to the employment of four; one on the outside, one on the inside, one on the front, and another on the back of the arm; all fastened in their respective situations with circles of double tape.

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* Sir A. Cooper on Dislocations, &c. p. 446.

† Op. cit. p. 450.

Although fractures of the humerus are generally cured with great facility, experience proves, that it more frequently fails to unite than any other bone, particularly when the fracture is oblique, and situated where the pectoralis major, latissimus dorsi, and teres major are inserted.

Sir Astley Cooper recommends a fracture, near the condyles, to be reduced by bending the fore-arm and drawing it forwards, in which position, a roller is to be applied. An angular splint, corresponding to the angle made by the humerus and fore-arm in the bent position, is to be applied to the inside of the limb, and a common splint to the front of the upper arm. These are to be secured with straps; an evaporating lotion used; and the fore-arm supported in a sling.* Dr. Physick employs two angular splints.†

In fracture of the internal condyle, a roller is to be applied round the elbow-joint, and kept wet with an evaporating lotion; the limb is to be bent to a right angle, and kept in a sling; and anchylosis prevented by a timely recourse to passive motion of the joint.

The treatment of a fracture of the external condyle consists in applying a roller to the joint, and then an angular splint, capable of receiving the elbow, and adapted to the back of the arm and lower side of the fore-arm. The splint is to be firmly fixed with a roller. In about three weeks, the joint is to be gently bent and extended, in order to prevent anchylosis.‡

FRACTURES OF THE FORE-ARM.

The radius and ulna are most liable to be broken where they are most slender, and hence, when fractured together, the injury seldom happens at parallel points of them. The radius, in consequence of its connexion with the carpus, and its receiving every shock communicated to the hand, is much more frequently broken than the ulna. The fracture is often situated near the wrist, or about the middle of the bone, and rarely towards its upper end. When the radius breaks, it is mostly from a fall on the hand, but, when the ulna alone suffers, or both bones are fractured together, it is generally in consequence of violence applied directly to the forearm.

In fractures of the fore-arm, the fragments are generally displaced, both with regard to the diameter and direction of the bone.

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* On Dislocations, p. 446.

† Gibson's Institutes, vol. i. p. 415.

‡ Sir A. Cooper, op. cit. p. 450.

The ends of the fracture are mostly inclined towards the centre of the limb. However, the upper portion of a broken ulna is not susceptible of this kind of displacement, on account of the manner in which it is articulated with the humerus. When both bones are broken, the limb is sometimes bent forwards, or backwards; but, though the fracture may be oblique, the ends seldom overlap each other; a kind of displacement, probably hindered by the interosseous ligament. In fractures of the thick portion either of the radius, or ulna, very little displacement is generally noticed.

Fractures of the radius are easily detected; for, on endeavouring to rotate the bone, or, in other words, to place the hand alternately in a prone and supine posture, a crepitus is immediately perceptible, and the upper fragment is motionless. When the two bones are broken, the nature of the accident is indicated both by the crepitus and the distortion of the forearm. Fractures of the ulna, especially when high up, are less obvious; but if the surgeon make pressure on each side of the suspected point, with his thumbs alternately, he will generally distinguish a grating sensation.

Fractures of the forearm, when unskilfully treated, are sometimes followed by one serious consequence, viz. the fragments unite in a position inclined towards the centre of the limb; the ends of the radius acquire a bony union to the ulna; no interosseous space is left; and the movements of pronation and supination are for ever lost.

As the fragments do not pass over each other, scarcely any extension is necessary for their reduction; but, the surgeon must gently press them away from the interosseous space.

The elbow is to be bent, and the hand put in the mid-state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. After the reduction, a piece of soap plaster is commonly applied, though it may very well be dispensed with, and over it a slack roller. Tight bandages have a bad effect by pressing the radius and ulna together, without the possibility of answering any useful purpose. Sometimes two graduated compresses, three inches wide, as long as the hand and forearm, and half an inch thick at their bases, are put on the palmar and dorsal surfaces of the forearm and hand, with their bases downwards. They are secured with a roller, the application of which is to begin at the hand, and extend a little way above the elbow. They render the limb every where of uniform thickness, and press the muscles towards the space between the bones*, so as to preserve it, and, with it, the prone and supine motions of the hand. Only two splints are necessary; one is to be placed along the inside, the other along the outside of the forearm. If the above described graduated compresses be not used, soft pads must be interposed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend nearly to the last joint of the fingers.

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* See Gibson's Institutes, vol. i. p. 418.

FRACTURE OF THE OLECRANON.

The olecranon is generally broken by falls or blows upon the elbow, and occasionally, though seldom, by the violent action of the triceps muscle; the injury may take place at various distances from the extremity of the process; the fracture may be single; or the part may be broken into several pieces. In consequence of the action of the triceps and the effect of bending the elbow, the detached fragment of the olecranon would always be drawn up a considerable distance from the rest of the ulna, were it not that some ligamentous fibres, connecting the olecranon to the coronoid process, and also the upper part of the coronary ligament, sometimes continue entire.* However, if the fracture be nearer the point of the elbow, the retraction will not be hindered by these ligamentous fibres. When the inflammation of the soft parts is very considerable, the use of a bandage and splint should be deferred three or four days, until the swelling has been diminished by leeches, venesection, cold applications, and other antiphlogistic remedies.

The treatment consists in relaxing the triceps and anconæus, by placing the arm in an extended position; pushing downward, and replacing the detached part of the olecranon; in confining it there with compresses and a circular bandage, applied immediately above the point of the broken process; and in maintaining the extended posture of the arm, by means of a pad and splint, bound on the front of the arm and forearm. Some practitioners object to keeping the limb completely extended, alleging that the cure is less perfect, the fragment more irregularly united, and the future movements of the joint less free, than when the elbow is kept slightly bent.

When the arm is too much extended, it is said that the detached portion of the olecranon is pushed from its notch in the lower head of the humerus, and does not correctly unite with the body of the ulna; but, if the forearm be not sufficiently extended, the olecranon may project too far after the cure, and come into contact with the humerus, before the limb is completely extended.† However, when it is recollected, that the union is generally effected by a ligamentous substance, the preceding reasons have little weight; and the principle of rendering the interspace between the fragments as little as possible, seems commendable. It is the practice to which Sir Astley Cooper gives the preference. In a month the splint is to be removed, and the joint gently moved every day.

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* See Sir A. Cooper on Dislocations, p. 458. ed. 4.

† C. Bell's Operative Surgery, vol. ii. pp. 182, 183.

FRACTURES OF THE METACARPAL BONES AND FINGERS.

In the treatment of fractures of the metacarpal bones, the essential object is to keep the adjacent joints perfectly motionless. For this purpose, the hand is to be placed upon a flat splint or hand-board, betwixt which and the palm, a suitable pad is to be put; a roller is to be applied, and the hand and forearm kept at rest in a sling. When the fingers are simply fractured, longitudinal pieces of thick pasteboard may be put along each side of the finger, and fastened with tape. The hand and forearm should be kept in a sling.

FRACTURES OF THE THIGH-BONE.

A fracture of the shaft of the thigh-bone is attended with severe pain in the situation of the injury; sudden incapacity to move the limb; a crepitus, which is sometimes very distinct on moving the ends of the fracture; deformity in regard to length, breadth, and direction of the limb. Concerning the deformity, it is necessary to have very precise ideas; for, as it has a continual propensity to take place, especially in oblique fractures, its prevention is the chief object in the treatment.

In oblique fractures, the limb is constantly shorter than that of the opposite side, a circumstance plainly indicative of a displaced state of the ends of the fracture. The shortening of the limb arises from the end of the lower portion of the bone being drawn upwards, beyond that of the upper fragment; which itself can undergo no retraction. The muscles are the only powers which can cause this motion of the lower end of the fracture, from below upwards. On one side attached to the pelvis, and, on the other, to the patella, tibia, and fibula, they make the former their fixed, and the latter their moveable point; and drawing upwards, inwards, and backwards, the leg, the knee, and the lower portion of the os femoris, they produce the displacement of the fracture: the principal agents being the triceps, semitendinosus, semimembranosus, rectus, gracilis, biceps, &c.

In Desault's works, a case is mentioned, that affords a striking illustration of the power of the muscles to displace the ends of the fracture. A man broke his thigh; but the ends of the bone continued duly together, though the fracture was oblique. This unusual circumstance was found to be owing to paralysis of the limb; and no sooner was the latter affection cured, and did the muscles regain their power of contraction a few days afterwards, than the lower end of the fracture was drawn upwards, as in ordinary cases.

A fractured thigh is most liable to be followed by a permanent shortness of the limb, when treated on a bed which is too soft and yielding. As the buttocks form a greater projection than the other parts of the body, they soon cause a depression in the bedding, and hence a declivity of the surface on which the trunk lies, so that the body glides downwards, pushing in the same direction the upper end of the fracture, and making it pass beyond the lower one.

Transverse fractures of the thigh, which are said to be more common in children, than adults and elderly persons *, are less liable than oblique cases to be attended with a shortening of the limb; because the surface of the upper end of the fracture makes mechanical resistance to the ascent of the lower portion of the broken bone.

The deformity of the limb, in regard to breadth, must necessarily accompany that in respect to length; but, it is quite obvious, that, in transverse fractures, the first sort of displacement may exist alone.

The deformity, in regard to direction, may result from the operation of the blow causing the fracture; from the awkwardness of those who carry the patient: or, from the bad position in which the limb is placed.

Besides the above kinds of deformity, the lower end of a fractured thigh-bone is mostly rotated outwards, an effect, which all the strong muscles have a tendency to produce, and which must always be increased by the weight of the leg and foot, when these are not adequately supported.

The higher the fracture is situated, the greater is the difficulty of keeping the fragments duly applied to each other. This is owing to the additional number of muscles, which acquire the power of drawing upwards the lower portion of the broken bone; and it must be plain to any surgeon, who devotes the least consideration to the subject, that such muscles as have their insertion above the breach of continuity, can have no effect in shortening the limb.

As the muscles of children are weaker than those of grown up patients, fractures of the thigh in them are generally attended with less displacement; a circumstance, perhaps, also in some measure explicable by the cases in young subjects being mostly transverse.

TREATMENT OF FRACTURED THIGHS.

Mr. Pott, seeing that the difficulty both in reducing displaced fractures of the thigh, and in maintaining the ends of the bone in a proper state of apposition, arose from the action of such muscles as draw upwards the lower portion of it, introduced into practice the method of placing the limb in a bent position, by which, he conceived, the most powerful muscles were relaxed. The same position he recommended, both at the time of reduction, and during the subsequent treatment. According to Mr. Pott, the position of the fractured os femoris should be on its outside, resting on the great trochanter; the patient's whole body

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* Delpech, Précis des Maladies Chir. t. i. p. 267.

should be inclined to the same side; the knee should be in a middle state, between perfect flexion and extension, or half bent; the leg and foot lying on their outside, also, should be well supported by smooth pillows, and should be rather higher in their level than the thigh. One very broad splint of deal, hollowed out and well covered with wool, rag or tow, should be placed under the thigh, from above the trochanter to quite below the knee; and another, somewhat shorter, should extend from the groin to below the knee on the inside, or rather in this posture on the upper side; the bandage should be of the eighteen-tailed kind, and, when the bone has been set, and the thigh well placed on the pillow, it should not, without necessity, be ever moved from it again until the fracture is united.*

Whoever peruses Mr. Pott's remarks on fractures with attention, will be led to think, that this eminent practitioner actually conceived, that the above position of the limb would relax every muscle connected with the broken bone; a thing which is certainly not effected. But, I believe, that when the direction, in which the lower end of the fracture is displaced, is taken into consideration, viz. upwards, behind the upper portion of the os femoris; and when the muscles, which have the greatest tendency to produce this effect, are calculated, it will be granted, that the majority of such muscles, *as have the greatest influence over the fracture*, are more relaxed in the bent, than they are in the straight position of the limb. However, Mr. Pott, by the term *relaxation*, might possibly mean only a state, in which the muscles are not actually stretched, though the origins and insertions of many of them might be brought much nearer together.

The bent position certainly does not completely incapacitate the muscles from displacing the fracture, and, of course, every possible assistance ought to be derived from the splints and the rest of the apparatus. The bent position is also attended with the great disadvantage of leaving the leg in a moveable, unsupported state; a consideration, in my mind, strongly against the practice, inasmuch as every motion of the leg creates the most hurtful disturbance of the fracture. The bent posture may relax some of the most troublesome muscles; but, it cannot hinder all of them from disturbing the fracture, and it leaves the leg unfixed. The extended posture may not relax quite so many of the muscles, which tend to displace the fracture; yet, it affords an opportunity of applying splints to the whole limb, an object of the highest importance.

There is one part of the position, advised by Mr. Pott, for which I have never heard any reason assigned. I allude to his direction to place the leg and foot rather higher in their level than the thigh. Whoever has had opportunities of seeing many cases of broken thighs, must know, that when the ends of the fracture are united, the toes are frequently turned more outwards than is natural. Now, nothing has a greater tendency to produce this deformity than twisting outward the lower portion of the broken bone, by elevating the leg and foot above the level of the thigh; a practice, which offers not a single advantage in return for this very serious effect of it.

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* Some few general Remarks on Fractures and Dislocations, in Chirurgical Works, vol. i.

Mr. Pott has mentioned only two splints: at present, whenever the bent position of the limb is chosen, a splint is usually laid along each of the four sides of the thigh. After duly placing the limb, the necessary extension is made. Then the under splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is laid under the thigh, from the great trochanter to the outer condyle. Before applying the soap-plaster, and other splints, the surgeon must of course take care, that the fracture lie as evenly as possible.

The position, recommended by Mr. Pott for a broken thigh, is disapproved of by many surgeons, first, because it leaves the knee at liberty to move about; secondly, because it is difficult to make the patient lie for any length of time exactly on his side; and lastly, because though the relaxation of the most powerful muscles may be advantageous, the half-bent position does not in reality render these organs incapable of displacing the two portions of the broken bone, and, therefore, every aid which can be derived from mechanical means should be employed, which is impossible in the foregoing posture of the limb.

When, as a modern surgeon has remarked, the limb is merely laid on the outside, gently bent, and secured with splints and bandages, the body and limbs of the patient lie well for some little time; the thigh rests upon its outside, and the body is inclined the same way: but, by and by, the patient turns directly on his back, while the leg remains with the outside of the foot flat upon the bed.*

Mr. C. Bell recommends a modification of the bent posture, the peculiarity of his method consisting in the limb being placed upon cushions, which rest upon two boards, joined together at such an angle under the ham, that, when the patient lies upon his back, the hip and knee-joints will be in a moderately bent position. Near the edge of the inclined boards, there are holes made, and pegs of wood fitted to them. The limb is to be placed upon the cushions on the frame. The bone is to be set; and then one long splint is to be laid along the outside of the thigh from the hip to the knee; another upon the inside of the thigh: and over these, the eighteen-tailed bandage. If the board under the thigh be found too long, the hip is to be raised by placing a cushion under it; but, if the board be too short, the hip is to be allowed to sink as much as circumstances require, or the size of the pad under the knee is to be increased. In order to keep the foot from moving laterally, the edges of the cushions are folded up, and fixed by the pegs, by which means the sides of the whole limb may be supported from the knee to the ankle.*

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* C. Bell's Operative Surgery, vol. ii. p. 191.

Twenty years ago, I saw used in St. Bartholomew's hospital an apparatus calculated for maintaining the limb in the bent position upon the heel, calf, and under surface of the thigh, while the patient lies upon his back. It was a more complicated machine, however, than the preceding, and applicable either to Mr. Pott's, or the straight position, and either to cases of fractured thighs, or broken legs. It was an ingenious contrivance, exhibited by Mr. Abernethy in his lectures; and, what is worthy of notice, it afforded a better support for the foot, than the frames employed by Sir Astley Cooper and Mr. C. Bell.

The bent position of the limb, however, is now abandoned by many judicious surgeons; and the straight, or extended posture adopted, which is certainly the most convenient for the application of an apparatus, calculated to afford support and steadiness to the whole member, and keep the knee and ankle-joints motionless. In this position, the chief reliance is upon two splints, one of which extends from the hip to the outside of the foot; the other from the space between the scrotum and the thigh down to the inside of the foot. The lower part of the external splint should be made to reach along the side of the foot, in order to afford support for a pad, which is to be placed there for hindering the foot from turning too far outwards.

Since no posture will hinder every muscle from having a tendency to displace a fractured thigh, several practitioners are yet inclined to believe, that the employment of permanent extension is a principle, which should not be relinquished.† At all events, no doubt can exist about the propriety of endeavouring to make the apparatus more perfect and efficient.

In common fractures of the thigh, Delpech prefers the extended position; but, when the bone is broken directly below the trochanters, and the upper fragment is drawn considerably outwards and forwards by the psoas and iliacus internus, he conceives that the bent posture is the most advantageous. It is a case, in which the frames described by Sir A. Cooper and Mr. C. Bell would be useful.

Oblique fractures of the condyles, extending into the joint, the first of these surgeons recommends to be treated in the extended position, because the tibia presses the extremity of the broken condyle into a line with that which is not injured. The swelling and inflammation are to be at first actively treated with cold evaporating lotions, leeches, and other antiphlogistic remedies. A roller is afterwards to be applied, and the joint, and parts of the limb above and below it, enclosed in strong pasteboard, put on wet, so that it may adapt itself to the shape of the limb. Lateral splints may also be employed, if preferred. In five weeks Sir Astley Cooper advises gentle motion of the joint.*

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* A similar apparatus has been employed by Sir Astley Cooper for nearly twenty years past. The first invention of the kind was made by Mr. White of Manchester, iron being used instead of wood. See Surgical Essays, Part ii. p. 49. 8vo. Lond. 1819.

† Delpech, Précis des Maladies Chir. t. i. p. 269.

FRACTURES OF THE UPPER PART OF THE THIGH-BONE,

Are divided into three kinds: first, that in which the fracture happens through the neck of the bone, entirely within the capsular ligament. Secondly, a fracture on the outside of the ligament, through the neck of the bone, at its junction with the trochanter major, the trochanter being split, and the neck of the bone received into its cancelli. Thirdly, a fracture through the trochanter major, beyond the point of union with the cervix. These distinctions, introduced by Sir Astley Cooper, are highly important, because they serve to reconcile the discordant statements respecting the possibility of effecting a bony union again; for while the first example appears from his experience not to admit of it, the two latter instances readily do so, like the generality of other fractures.† The following are the symptoms of a fracture within the capsular ligament: the limb is from one to two inches shorter than the other, the trochanter being drawn up by the muscles as high as the ligament will permit. The limb may be easily lengthened by extension; but immediately it is left to itself, the retraction takes place again. In a very few instances the limb is not shortened; a fact, which is ascribable to the obliquity of the fracture, the upper portion of the bone hindering the ascent of the lower; or to other particularities in the shape of the solution of continuity, by which the fragments are entangled and locked to each other. Another symptom is the eversion of the foot and knee; an effect which all the strongest muscles, connected with the thigh-bone, tend to produce; and, although cases do present themselves, in which those parts turn inwards, they are extremely rare. In fact, they are not fractures within the capsular ligament, but examples, in which the fracture separates, along with the head of the bone, that part of the trochanter major, to which many of the muscles, possessing the power of rotating the limb outwards, are attached, and leaves connected with the shaft that part of the trochanter major, in which the glutæus medius is inserted. For this correct explanation, the profession is indebted to Mr. Guthrie‡, who had an opportunity of dissecting such a case, and his statements are confirmed by the particulars of an examination of another similar case by Mr. Symes, of Edinburgh.§ The patient, when perfectly at rest in the horizontal position, suffers but little, but any attempt at rotation is attended with pain, which is particularly felt at the upper and inner part of the thigh. Extension of the thigh may be performed; but its flexion is more difficult, and painful.* The next thing that deserves attention, is a remarkable diminution of the natural distance between the trochanter major and crista of the ilium. When the surgeon takes hold of the bone near the knee with one of his hands, and moves it, while he applies the other to the great trochanter, this process is found to be extremely moveable, but less prominent than usual, and during the movements a crepitus is sometimes distinguishable. As a very little displacement, however, separates the fragments, a crepitus cannot always be perceived. According to Sir Astley Cooper, it is most readily detected by extending the limb, and rotating it inwards.

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* On Dislocations, p. 213. ed. 4.

† Ibid. p. 103. ed. 4.

‡ Med.-Chir. Trans. vol. 13.

§ See Edinb. Med. Jour. No. 87.

When the limb is shortened in a case of dislocation, the toes turn inwards, and are fixed in that position; but, in a fracture of the neck of the bone, the toes may be turned outwards or inwards by the surgeon, without much opposition.

Women are much more liable to this species of fracture than men; which is referred by Sir Astley Cooper to the more horizontal direction of the neck of the bone in females. One circumstance that promotes the frequency of the accident is the natural spongy structure and thinness of the shell of the bones of old persons, in whom the case is chiefly met with. It is calculated, indeed, that out of every ten fractures of this description, nine take place in subjects above the age of sixty. Sir Astley Cooper, in an extensive practice, during thirty years, in the course of which he has seen at least 225 of these cases, has known of only two within the capsular ligament happen in patients under fifty.† In women, the neck of the thigh-bone stands out nearly at a right angle, while, in men, it has a sloping direction: hence, it is more apt in the latter to be broken by a fall on the side, or a force operating upon the great trochanter.

When force is directed against the os femoris from before or behind the limb, a fracture of the neck of the bone is more likely to happen than a dislocation, on account of the great depth of the acetabulum, and the firm manner in which the head of the bone is secured in the socket. A fall upon the great trochanter; a similar fall upon the knee; or alighting with force upon the feet; a powerful twist of the thigh-bone, may all produce a fracture of its neck. Hagedorn, the author of a valuable treatise ‡ on fractures of the neck of the thigh-bone, considers a fall upon the great trochanter as the most frequent cause of the accident, which is true with respect to men. In London, Sir Astley Cooper regards a sudden slip of the foot off the curb-stone as the most common cause of the injury.

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* Sir A. Cooper on Dislocations, &c. p. 106.

† On Dislocations, p. 111. ed. 4.

‡ Abhandlung über den Bruch des Schenkelbeinhalses, nebst einer neuen Methode denselben leicht und sicher zu heilen. Leipzig, 1808.

In all the examinations, which Sir Astley Cooper has made of transverse fractures of the neck of the thigh-bone, *entirely within the capsular ligament*, he has never met with an instance, in which a bony union had taken place, or where there was not motion of one end of the bone on the other. He does not deny, however, that, under particular circumstances, such an union may be possible, when the bone is broken, without the periosteum being torn, and when the fracture is oblique, partly within, and partly on the outside of the capsular ligament. He refers the hindrance of a bony union in cases of transverse fracture, strictly within the capsular ligament, to laceration of the ligamentous sheath and periosteum of the neck of the bone, and to a consequent deficiency of circulation in the head of the bone. If a fracture were to happen, without the reflected ligament being torn, he conceives, that the bones might unite; but, the symptoms would be different; the nature of the injury would scarcely be discerned; and the cure require little surgical attention.* In other cases, of the nature already specified, ossific union is not produced; slight attempts at it are made upon the neck of the bone, and upon the trochanter major, but scarcely any upon the head of the bone; and, when union takes place, it is by means of ligament.†

The fibrous expansion, which invests the neck of the femur, serves the office of the periosteum, and is the principal means through which the smaller fragment is supplied with blood. When it is torn, the latter portion of the bone is scarcely capable of contributing at all to the process of union, and the surface of the other fragment at length throws out irregular masses of a soft fleshy substance, in the midst of which the inner fragment remains, more or less moveable, without any other kind of connection to the rest of the bone.

Sometimes, a fibrous ligamentous substance becomes the uniting medium, the subsequent lameness is great, and the limb shortened.

Lastly, in old subjects, the friction of the pieces of bone against each other frequently causes them to be worn away, or absorbed, the neck of the bone entirely disappearing. Indeed, it would appear from Sir Astley Cooper's observations, that, in aged persons, the neck of the thigh-bone sometimes naturally undergoes an insterstitial absorption, by which it becomes shortened, altered in its angle with the shaft of the bone, and so changed in its form as, upon a superficial view, to give an idea of its having been formerly broken.‡

The treatment, recommended by Sir Astley Cooper, consists in placing a pillow under the limb, its whole length; putting another under the knee; and keeping the limb in this extended position ten days or a fortnight, until the inflammation and pain have subsided. The patient is then to rise and sit in a high chair, in order to prevent a degree of flexion which would be painful. He is next to walk with crutches, bearing gently on the foot at first, and, by degrees, more boldly. Lastly, a high-heeled shoe is to be worn, and the crutch exchanged for a stick. Sir Astley admits, however, that, in every case in which a doubt exists whether the fracture may not be partly or wholly on the outside of the capsular ligament, the same treatment should be followed, as if it were certainly an example, in which an osseous union could be produced.

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* On Dislocations, &c. p. 114. ed. 4.

† Op. cit. p. 124.

‡ A. Cooper, Surgical Essays, part ii. p. 26.

In an impartial conideration of this subject, two facts, admitted by all parties, seem to me to deserve particular attention; the first is, that an union by means of a ligamentous substance frequently takes place; the second is, that the surgeon generally cannot know whether the fracture is entirely within the capsular ligament, or not. Both these reflections would incline me to give the patient the best chances of union, with as little deformity as possible, by maintaining the limb steadily in the most eligible posture. This will be presently explained, when I describe Hagedorn's apparatus.

Fractures of the neck of the thigh-bone on the outside of the capsular ligament, and extending into the cancelli of the trochanter major, admit of bony union. According to Sir Astley Cooper, the limb is shortened about half, or three-quarters of an inch; the toes are turned out; great pain is felt at the hip, and on the inner and upper part of the thigh; and the roundness of the joint is lost. The circumstances, however, particularly denoting the nature of the accident, are, first, its general occurrence in young persons and adults *under fifty years of age*, though it does also sometimes happen beyond that age. Secondly, whilst the fracture within the capsular ligament is mostly produced by very slight causes, this is caused either by severe blows, or falls upon the edge of some projecting body, or by the passage of heavy carriages over the pelvis. Thirdly, the crepitus is readily perceptible, without drawing down the limb. Fourthly, a great deal of ecchymosis is frequently present. Fifthly, the upper part of the thigh quickly becomes swelled and painful. Sixthly, the case is generally productive of much more suffering, than a fracture within the capsular ligament.*

In fractures of the neck of the thigh-bone, the half-bent position of the limb, with the patient resting upon his side, ought for several reasons to be abandoned. When this mode of treatment is adopted, the posture soon alters, no efficient apparatus can be employed, the length of the injured limb cannot be compared with that of the uninjured one, and severe pain and other bad effects are the result of the continual pressure on the great trochanter.

With respect to the modification of the bent position, by letting the under part of the thigh, the calf, and the heel rest upon two boards, which gradually rise from the surface of the bed to an angle in the ham while the patient lies upon his back, I think it a much better plan, than that recommended by Mr. Pott. At the same time, I consider it imperfect, because it does not make adequate extension, nor afford proper support and steadiness to the foot.

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* Sir A. Cooper on Dislocations, &c. p. 145. ed. 4.

The principal parts of Boyer's apparatus are, a splint of particular construction, a foot-support, and a kind of padded belt, which is buckled round the upper part of the thigh.

The splint should be four feet long, and three finger-breadths wide. A groove, half an inch broad, and the extremity of which is covered with iron, runs along about half the length of the splint. To this groove a screw is adapted, which occupies its whole length, one end of it being supported against the plate of iron covering the extremity of the groove, and the other made to fit a key, by means of which it is to be turned. On the inside of the splint, a contrivance for holding up the foot-support is fastened to this screw. The upper part of the splint is received in a pocket situated on the external side of the circular thigh-belt. The sole, or foot-support, is made of iron, and covered with soft leather. It is connected by means of a mechanical contrivance to the above-mentioned screw. To that part of it which is near the heel, a broad piece of soft leather is attached, which, being split into two straps, serves for fixing the sole to the foot.

The thigh-belt is composed of strong leather, covered with the same material, of a softer quality, and well stuffed with wool. Near the place where its two ends are buckled together on the limb, the little leather pocket is sewed for the reception of the upper end of the long external splint.

The apparatus is applied as follows: after having surrounded the upper part of the thigh with a soft cotton band, the padded leather thigh-belt is put over it. The foot and lower part of the leg are then to be protected with tow, soft cushions, or any other soft materials, from the effects of pressure, and the sole is to be applied to the foot. The upper end of the splint is now to be fixed in the pocket of the thigh-belt, and the sole is fastened at the proper place to the screw part of this long external splint. Pads, tow, or other soft materials, are next to be employed, wherever needed for preventing the ill-effects of the pressure of the foregoing apparatus, and also of two other splints, which will be required. One of these is laid all along the front or upper surface of the limb, the other is applied to the inner side of it; and both are secured in the ordinary manner.

Things being thus arranged, the screw in the groove is turned by the key, and the sole descends and brings the foot with it, while the superior part of the splint is pushed upwards. Thus, the limb may be gradually extended, and the extension, if necessary, increased.*

Perhaps, the best apparatus ever invented for fractures of the neck of the thigh-bone, is that suggested by Hagedorn. His opi-

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* See Traité des Maladies Chirurgicales et des Opérations qui leur conviennent par M. le Baron Boyer, t. iii. p. 299., &c., 8vo. Paris, 1814.

The nature of Boyer's ingenious apparatus will be better understood by reference to plate 8, fig. 1.

a. a. a. The limb extended

nion is, that every apparatus for these cases should be calculated to fulfil the following indications. 1st. It should keep the leg duly extended, and at the same time prevent the foot from being turned outwards. 2. As all pressure on the muscles of the thigh has a tendency to make them contract, the extension is more effectual when applied, not to the thigh, but to the lower part of the limb. 3. The apparatus must be made as little irksome to the patient as possible. 4. The patient should not have it in his power to interfere with the extension and reduction. 5. The apparatus should admit of the employment of fomentations or other applications.

A reference to plate 8, figs. 2, 3, and 4, will convey an adequate idea of Hagedorn's ingenious apparatus, the principle of which is simple, and effectual in fulfilling the requisite indications.

See plate 8, fig. 2. A view of the outside of Hagedorn's splint, which for an adult is between three and four feet long, about five inches broad at its upper end, and becomes gradually narrower down to its lower extremity, where it is not much more than two inches wide. On its inside it is excavated from its highest part down to a little below the calf, where the concavity ceases, by which means the inferior part of it is stronger, and more fit for bearing the screws, foot-board, &c.

a. a. a. a. The slack leather, with the nails attaching it to the outside of the splint.

c. c. The middle of the splint, from which point it becomes smaller and smaller down to its lower termination, *d.*

d. The lower end, to which the foot-board *e e* is firmly fixed.

Fig. 3. The foot-board.

a. a. Two-holes, through which the foot-board is screwed to the splint when the case is a fracture of the neck of the left thigh-bone.

b. b. Two similar holes, when the fracture is on the right side.

c. c. The edge of the foot-board made thicker, the breadth an inch, or an inch and a half, and strengthened with a plate of iron, in order to make it capable of firmly holding the screws, which fasten it to the lower end of the splint.

d. e. f. g. Four rows of slits, or holes through which the ends of the bandage pass, which fasten the foot to the foot-board.

Fig. 4. Represents the whole apparatus, as employed in the treatment of a fracture of the neck of the left thigh-bone.

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b. b. b. The splint for making continued extension.

c. c. The screw for lengthening the splint.

d. The key, or handle for turning the screw.

e. e. The moveable worm, or female-screw, through which the long screw passes. It is furnished with plates, and calculated to slide upon the splint.

f. The upper end of the splint received in the little pocket on the outside of the thigh-belt.

g. The thigh-belt applied.

h. h. h. h. The upper, or front splint, applied.

i. i. i. i. i. Pads filled with wheat-chaff, or other soft materials.

k. k. k. k. k. Tapes with which the whole apparatus is fastened.

l. The iron sole.

m. m. The supports of the iron sole.

a. a. a. a. The splint applied to the uninjured limb.

b. b. b. A long pad placed between the splint and the outside of the limb.

c. c. The sound limb.

d. d. The left limb, in which the neck of the thigh-bone is fractured.

e. e. The foot-board.

f. f. f. f. Four leather bands, with straps and buckles for securing the splint and long pad upon the sound limb.

g. g. The leather contrivances, somewhat like gaiters, designed to connect the feet securely with the foot-board. Each of these leather bandages has four straps, two of which are conveyed on each side of the foot through two of the holes in the foot-board, and fastened underneath it. The leather, of which these pieces of the apparatus are made, should be rather stiff, and well quilted within, or lined with very soft materials. In front, each of these foot or ankle-pieces admits of being laced, so as accurately to fit the part.

h. The broad linen band, which keeps the foot inclined inwards. Between this band and the instep, some soft materials, or a pad should be placed. It has four tails, two of which on each side pass through the anterior rows of holes in the foot-board, and are tied underneath it.

i. i. A soft linen band, the use of which is to fasten the splint to the pelvis.

k. An empty space, which is sometimes filled up with a small pad.

Between the soles of the feet and the upper surface of the foot-board, soft pads are placed, which being of the same shape and size as the soles of the feet, do not appear in this engraving.

Previously to the reduction the splint is to be fastened upon the sound limb, and the two ankle-leathers applied. After the reduction, two assistants are to keep the limb extended, while the surgeon screws on the foot-board, and places under the sole of the sound limb the pad, or little cushion, which becomes secured in this situation as soon as the four tails of the ankle-leather have been drawn through the first and second rows of slits in the foot-board, and tied underneath it in a couple of surgeon's knots. The sound limb is now to be approximated to the broken one; both are to be put in the most natural situation and position; the other cushion is to be interposed betwixt the foot-board, and the sole of the fractured limb; the four tails of the ankle-leather on the injured member are to be drawn through the first and second rows of slits in the foot-board and tied; the foot-board itself is now to be screwed to the splint as firmly as possible, and a little wedge, not mentioned in the previous account, pushed into the space between the two screws and the foot-board. Lastly, in order to prevent the toes from being turned outwards, the band is applied across the upper part of the foot, and its tails fastened under the foot-board.

Dr. Gibson, professor of surgery in the University of Pennsylvania, having found, upon trial, that Hagedorn's apparatus did not prevent an inclination of the pelvis towards the affected side, makes use of two splints, which extend from the arm-pits, where they are padded like the head of a crutch, along the sides of the body, thighs, and legs, and beyond the feet. Their inner surface, is lined with soft materials, and they are fastened with six or eight broad tapes, or bands, applied round the limbs, pelvis, and chest. In other respects, the apparatus resembles that proposed by Hagedorn.*

Fractures extending obliquely through the trochanter major, have frequently been confounded with those of the neck of the bone. They occur at every period of life. According to Sir Astley Cooper, the leg is little, or not at all shortened; the foot is benumbed; the broken portion of the trochanter is sometimes drawn towards the ilium; sometimes towards the tuberosity of the ischium; but it is generally widely separated from that portion which remains connected with the neck of the bone. The foot is much turned out, and, if the trochanter be much displaced, a crepitus not readily felt. The upper part of the trochanter is fixed, while the rest of it follows the motions of the thigh-bone. The treatment consists in maintaining the external portion of the trochanter in a due position, with respect to the internal fragment, by means of a pad and bandage round the pelvis, the limb being kept in the horizontal posture, and perfectly quiet, with the feet attached to a foot-board. An apparatus, constructed on the principles of that suggested by Hagedorn, might here be advantageous.

FRACTURES OF THE PATELLA

Are generally transverse; seldom oblique; and still more rarely longitudinal, or perpendicular. The bone, however, is sometimes broken into three or four pieces.

A longitudinal fracture, and that in which the patella is split into several pieces, are invariably produced by a fall, or a blow, and are attended with a good deal of contusion, and sometimes with a wound. A transverse fracture may also be produced in the same way; but its usual cause is a violent contraction of the extensor muscles of the leg, when the body is inclined backwards, and the patient is in danger of falling upon his occiput. In this dilemma, the knee being bent, the extensor muscles of the leg act with considerable force to assist in bringing the body forwards again; while the patella, the posterior surface of which at this moment only rests upon a point of the forepart of the condyles of the femur, is placed between the resistance of the ligament connecting it to the tibia, and the action of the extensor muscles. Under these circumstances, if the action be superior to the resistance, the bone snaps; an event now more likely to happen, because in consequence of the flexion of the knee, the direction of the extensor muscles and that of the ligament of the patella, are rendered oblique with respect to the vertical axis of this bone. Hence, these two powers, one of which acts upon the upper, and the other upon the lower, portion of the patella, have the effect of tending to bend it backwards exactly at that point which rests upon the condyles of the thigh-bone.*

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* Gibson's Institutes, vol. i. p. 445.

Though such is the principle on which the generality of transverse fractures of the patella are produced, a few cases upon record establish the possibility of the bone being also broken by the violent action of the muscles, while the leg is perfectly straight, and, of course, the force applied precisely in the axis of the bone. Thus, the fracture has been known to take place during an attack of convulsions, while the patient was stretched upon his back.

Whether the ligamentous expansion covering the anterior surface of the patella be lacerated or not, is a circumstance which makes an important difference in simple fractures of this bone. In general, when the knee has not been considerably bent in the fall, or by improper examinations of the limb, the above ligamentous layer is left partly, or entirely unlacerated; and the fragments of the bone are then only moderately separated from one another. But, when the knee has been violently and repeatedly bent, the ligamentous covering of the front of the patella is more or less torn, and the pieces of bone drawn further asunder.

The history of surgery does not furnish numerous instances of the longitudinal fracture of the patella: one such case, however, is related by Lamotte.

There is no difficulty in ascertaining the existence of a transverse fracture of the patella. When the patient is standing up at the period when the force of the muscles breaks the bone, the subsequent fall is a consequence of the accident. In this case, as well as in the example in which the bone is broken by the fall itself, the patient cannot get up without succour; and if, when he is put upon his legs, he endeavour to walk a few paces forwards, he falls down again. But, if he be assisted with an arm, and keep his limb straight, he may hobble along a good way, and meet with no other fall, especially if the ground be not too irregular. The transverse division of the bone, and the interspace between the two fragments, can be plainly distinguished under the integuments. Instead of the prominence of the patella in front of the knee, a flatness or even a depression may be remarked. When the leg is extended and the thigh bent, the two pieces of bone are brought near together again, and a very little pressure will then suffice for putting them in contact with each other. When this has been done, if they be moved laterally in opposite directions, they will rub against each other, and a crepitus be felt. However, it is only when the soft parts are not considerably swelled, that the solution of continuity in the bone, and the separation of the fragments are manifest.

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* Boyer, Traité des Maladies Chirurgicales, tom. iii. p. 322, 325. 8vo. Paris, 1814.

Fractures of the patella are rarely united by bone, the connecting medium being in almost all cases a fibrous ligamentous substance. The possibility of a bony union, however, is universally admitted; and Lallemant * had a preparation, which exemplified the fact.

But, though experience may hold out little hope of these fractures being accurately united by bone, the same source of knowledge leaves no doubt of one important fact relating to this point, viz. that, when the union is effected by means of a ligamentous substance, the perfect action of the extensor muscles, and, of course, the exemption from future infirmity of the knee, will mainly depend upon the shortness of the connecting medium, and the little distance between the two fragments.

In the treatment of a transverse fracture of the patella, the indications are:

1st. To place the limb in a position, that will relax the extensor muscles of the leg as much as possible.

2dly. To maintain the limb in this position by means, which will counteract the efforts of the flexor muscles.

3dly. To keep the fragments pressed towards each other.

The requisite apparatus consists of a hollow splint, long enough to reach nearly all along the back part of the thigh and leg, and lined with a suitable pad. A small compress; a common roller; and three or four pillows.

The first thing is to put the patient in such a posture as will relax the extensor muscles of the leg, and allow the pieces of the patella to be placed near together. With this view, the patient is to lie with his trunk and head somewhat elevated, by which means the anterior inferior spinous process of the ilium, from which the rectus muscle arises, will be inclined forwards towards the thigh. Then an assistant is to take hold of the foot, and raise the limb from the bed, being very careful to keep the knee from bending; and when the thigh and leg have been thus elevated to such an angle, as will perfectly relax the muscles attached to the patella, the surgeon is to form with the pillows above mentioned a surface for the support of the limb, gradually rising from the buttock to the heel.

The long splint and its cushion are now to be laid under the thigh and leg, secured with the roller, and kept up at a proper angle with the pillows. At first, an evaporating lotion should be applied to the knee itself, and no pressure made on it, till the

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* Richerand, Nosographie Chir. t. ii. p. 387. ed. 4. The case is detailed by Boyer, in his Traité des Maladies Chir. t. iii. p. 355. See other cases referred to by Sir A. Cooper; On Dislocations, &c. p. 201. ed. 4.

swelling and inflammation have been reduced by antiphlogistic remedies. Then the fragments of bone having been pressed towards each other, are to be kept so with a compress placed just above the upper one, and bound there with a few turns of the roller; the bandage being applied to the joint in the form of the figure 8, so that the turns go to the ham, and also above and below the patella.

For keeping the pieces of bone near each other, Sir Astley Cooper employs a leather strap, which is buckled round the thigh, above the upper fragment. Another strap is then applied to the middle of the foot, and its two ends, being carried up the sides of the limb, are buckled to the strap round the lower part of the thigh. The longitudinal strap may be fixed to the foot and leg with tapes.

Many surgical writers recommend the knee to be moved a little every day at an early period of the treatment, in order to prevent the joint from becoming stiff. But, premature flexion of the knee will have the effect of elongating the uniting substance of the two fragments of bone, and increasing the distance between them; the sure consequence of which will be a permanent weakness of the knee, much more serious than the curable rigidity proceeding from confinement of the joint. For this reason, Boyer generally enjoins his patients not to begin to bend their knees earlier, than two months after the accident. Sir Astley Cooper has recourse to passive motion of the joint in five weeks, unless the patient be old, in which case he keeps the limb perfectly at rest for a week longer.*

When the case has been badly treated, or neglected, and the upper piece of the broken patella continues permanently retracted far up the thigh, with a long ligamentous substance forming the connection between the two fragments, experience proves, that the extensor muscles of the leg may gradually regain a good deal of the power which they have lost under these circumstances. As an illustration of this fact, Mr. Abernethy mentions in his lectures the advice given by Mr. Hunter to a patient in this condition: it was that he should sit upon a table, and frequently try to put the extensor muscles of the leg in action, while the limb was swinging backwards and forwards. By persevering in this way for some time, the patient at length found, that he had some power of extending the leg. A weight was now put on the foot, and increased in proportion as the muscles recovered their power.

FRACTURES OF THE LEG.

When the two bones are broken, the solutions of continuity are sometimes parallel; sometimes at different heights. The direction of the fracture of each bone is also subject to variety; in some cases being transverse, which is most common in children; in other instances, oblique; and, what is remarkable, the obliquity of fractures of the tibia has something determinate about it, usually extending from below upwards, and from within outwards, so that the end of the upper fragment is generally manifest below the integuments at the front and internal part of the leg. Lastly, either of the bones may be broken in several places, and the soft parts more or less contused, or lacerated, either by the ends of the broken bone, or the same force which occasioned the fractured itself.*

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* On Dislocations, p. 204., ed. 4.

Cases, in which the two bones are broken, are frequently the consequence of falls upon the feet, the fracture being mostly oblique, and that of the tibia situated a little below its middle portion. However, when the tibia gives way at this point, the fibula often breaks towards one of its extremities. As the tibia alone sustains the weight of the body, it is evident, that when both bones are broken by a force, which acts perpendicularly, the tibia gives way first, its fragments are displaced, and the force continuing to operate, then bends the fibula, the fracture of which is subsequent to that of the other bone. Both bones of the leg may also be fractured by direct violence, as when the wheel of a carriage passes over the limb, or a heavy body falls upon it.

The displacement of the fragments depends upon the direction of the division of the bones, and the nature of the cause of the injury. When the fracture is transverse, the displacement can only take place in the diameter of the fragments, particularly when the injury is situated high up, where the surfaces of the broken part of the tibia are large. In fractures of both bones of the leg, however, the ends of the bone seldom remain long in their natural situation, even when their surfaces are broad, and the solution of continuity is transverse, because every movement of the limb has a tendency to produce displacement. When the fracture is oblique, and has been produced by a fall on the foot, the ends of the fracture must inevitably pass beyond each other. In the majority of instances, the end of the upper piece of bone presents under the integuments of the shin a sharpish point, directed downwards and inwards; while the extremity of the lower portion is drawn backwards and outwards by the muscles of the calf.

The lower portions of the broken bones are liable to a rotatory displacement; the tendency to which is increased by the foot being naturally turned outwards, and the greater portion of its mass and weight being external to the axis of the limb.

Fractures of both bones of the leg are readily ascertained; for the slighest deformity is obvious along the sharp ridge termed the spine of the tibia, as well as upon its anterior flat surface, usually called the shin. The gentlest movement of the limb will produce a very plain crepitus.

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* Boyer, Traité des Maladies Chir. t. iii. p. 361.

To the directions given in the Dictionary, for the reduction and treatment of ordinary fractures of the tibia and fibula, I have nothing particular to add in the present place; but, there is one case, which I am called upon to notice, because, on its treatment, Pott and Dupuytren offer different sentiments. Having given in the article *Dislocation* of the foregoing publication, the opinions of the first of these eminent surgeons on the utility of the bent position, and of the relaxation of the strong muscles of the leg, in the management of fractures of the fibula, accompanied with luxation of the ankle, I shall not here recapitulate his arguments; but confine myself to a plain statement of Dupuytren's observations, the value of which can only be determined by fair and comparative trials of the two modes of practice recommended.

The plan of treating fractures of the fibula, with luxation of the foot, in general use in England, is that of Pott; but, notwithstanding the greatest care and attention, it is alleged, that some degree of distortion of the foot, or confinement of its movements from a little displacement of the fractured portions of the fibula, has been a frequent consequence of this accident so managed. It is said, that Pott's method of treatment is not calculated to prevent the falling-in of the lower extremity of the fibula towards the tibia. In a fracture of the lower end of the fibula, when the foot is brought into the state of extreme adduction, it draws by means of the lateral ligaments the point of the outer malleolus in an inward direction, and, consequently, the fractured portion corresponding to it is drawn outwards from the tibia. It is on this principle, that Dupuytren's mode of treating this accident is founded. In all cases, then, a fracture of the fibula, accompanied with luxation of the astragalus inwards, (that is with distortion of the foot outwards,) requires an apparatus, which maintains the foot turned inwards, and the inferior fragment of the fibula raised from the tibia, and in the direction of the superior fragment. The simple apparatus recommended by Dupuytren is as follows: a cushion, a splint, and two bandages are the whole of it. The cushion, made of linen, and stuffed two-thirds full of hair-balls, or chaff enclosed in bags in the usual manner, should be two feet and a half in length, four or five inches in breadth, and three or four inches in thickness. The splint is to be from twenty to twenty-three inches in length, and three inches broad. Lastly, the two rollers should each be from four to five yards in length. The cushion, doubled in the form of a wedge, should be applied on the internal side of the fractured limb, its base below, and resting on the internal malleolus, without passing beyond it; its summit above on the internal condyle of the tibia. The limb is thus protected from the splint, which derives from the pad a support, that keeps it at the distance of several inches from the internal margin of the foot, and at the same time tends to throw the tibia outward. The splint, applied along the cushion, should extend six or seven inches below it, which will be about four inches below the internal margin of the foot. These parts of the apparatus being thus disposed, should then be fixed by one of the bandages passed round the limb below the knee, when the portion of the splint extending below the cushion will leave between itself and the foot an interval of several inches, and furnish a *point d'appui* to which the foot may be drawn from without inwards. In order to effect this purpose, the second bandage should be drawn from this point over the instep and heel, alternately embracing the splint and the parts of the limb just indicated, in circles gradually lessening, and forming the figure of the cypher 8 with the crossing part on the splint. Thus, the apparatus acts on the principle of a lever of the *first kind*, in which the *point d'appui* is the base of the cushion, a little above the malleolus internus, and in which the resistance, as well as the power acting on the fracture, are in the extremities of the foot. The foot thus drawn must yield to the action of the lower bandage, while the tibia, pressed by the base of the cushion, must be propelled outwards with the astragalus. Lastly, it is evident, that as the lower fragment of the fibula is drawn downwards by the external lateral ligaments of the ankle, a tilting movement must be produced on the external surface of the astragalus, contrary to that which displaced it. With a view of obtaining a complete reduction, Dupuytren says, that the surgeon must not confine himself to drawing the foot in a perpendicular line under the limb; it must be brought as much inwards as it had been turned outwards by the peroneal muscles.

After the foot has been retained a good while in this forced state of adduction, if it should not return to its ordinary position, the defect may be easily remedied by applying the preceding apparatus to the outer surface of the leg and foot.

When, with a fracture of the fibula, the foot is drawn backwards and upwards, Dupuytren applies the splint and cushion to the back part of the leg down to the heel. One roller is applied below the knee; and a second round the lower end of the tibia and splint. A square pad should always be put between the lower bandage and the tibia. Of 207 cases of fracture of the fibula, comprising all the varieties of this accident treated in the above way, by Dupuytren, 202 were cured; the remaining five died, three of them from the consequences of the injury itself, or from complications independent of it.

Seven-tenths of them happened to the right leg; six-tenths arose from violent adductive motions of the foot; three-tenths from similar abductive movements; and one-tenth from blows, or the passage of some heavy body over the external and inferior part of the limb. With respect to the seat of the fracture of the fibula; in five-tenths it was two inches from the lowermost point of the external malleolus; in three-tenths, below this point; and in two, above it. Cases, within two inches of the external malleolus, were often complicated with displacement of the foot; the others but rarely.*

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* See Mémoire sur la Fracture de l'Extrémité inférieure du péroné, les lux-

Sir Astley Cooper's treatment of a fracture of the fibula, near the ankle, consists in applying a many-tailed bandage, which is kept wet with a lotion of spirit of wine and water; putting on each side of the limb a splint with a foot-piece, furnished with cushions, by means of which the great toe is maintained in a line with the patella. The limb is laid on its side, in the half-bent posture.

In fractures of the tibia at the ankle, his splints are also provided with foot-pieces, padded so as to incline the foot inwards, and keep the great toe in a line with the patella.*

CHAP. LXI.

PARTICULAR DISLOCATIONS.

DISLOCATION OF THE LOWER JAW.

In children, the rami of this bone form, with its body, or rather the plane of its base, a very open angle, these parts being in reality almost in the same line. By reason of this conformation, the condyles are articulated with the base of the cranium at a very acute angle, the sinus of which is turned forwards. Hence, an obtuse angle, with the base of the skull could never be produced, unless the lower jaw were depressed in a degree which never happens, and which neither the length of the elevator muscles, the natural mode of opening the mouth, nor even the situation of the vertebral column will permit. Hence, children are not subject to dislocations of the jaw, notwithstanding, they are commonly putting large substances into their mouths, and doing those things, which are well known to promote at other periods of life the occurrence of the accident.†

The lower jaw is subject to only one species of dislocation, namely, that in which the condyles advance forwards over the eminentiæ articulares, and slip under the zygoma. Sometimes the luxation is confined to one side; but, more commonly, both condyles are displaced. A case is noticed by Sir A. Cooper under the name of subluxation, in which the condyle merely slips out of the interarticular cartilage, and the jaw becomes motionless, with the mouth slightly open. The case generally rectifies itself; but he has known it continue some time.‡ The two first cases, which are the only ones requiring particular notice, ought unquestionably

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ations, et les accidens qui en sont la suite, par M. Dupuytren, in Annuaire Medico-Chirurgical des Hôpitaux de Paris. 4to. Paris, 1819.

* On Dislocations, &c. p. 331, 332. ed. 4.

† Boyer, Traité des Maladies Chir. tom. iv. pp. 77, 78.

On Dislocations, &c. p. 363.

to have appropriate names — names, which will not convey any erroneous notion: therefore, instead of calling the displacement of both condyles a *complete dislocation of the jaw*, and that of one condyle, an *incomplete dislocation*, terms which may lead to the supposition, that there are cases, in which the condyles do not entirely quit the articular surface of the temporal bone, I should think with Boyer, that it is best to denominate the displacement of both condyles simply a *dislocation of the jaw*, and the other instances, *dislocations of the right, or left condyle.*

When the lower jaw is dislocated by the action of the muscles, as in gaping, vomiting, laughing, &c. the muscles inserted into the os hyoides first depress the bone, and, in proportion as this movement increases, the pterygoideus externus acts, and draws the condyle and interarticular cartilage forwards upon the eminentia articularis. When the mouth is wide open, a very moderate blow, or force, applied to the chin, in the direction downwards, will cause a dislocation of the condyles. The violence, used in the extraction of a tooth, will sometimes produce it. *

When the lower jaw is dislocated, the mouth is at first widely open, and the space between the two arches of the teeth considerable; but, a short time afterwards, this distance is lessened, the two jaws come nearer together, and the edges of the incisores teeth remain about an inch and a half asunder. This change, which sometimes takes place immediately after the luxation, is to be ascribed to the action of the temporal muscle, which has the more effect because its insertion into the coronoid process is now nearly at a right angle. This movement, however, cannot be carried so far as to bring the teeth together, because the coronoid process actually touches the cheek-bone. The upper and lower teeth no longer correspond: the lower incisores being too much forwards; and if the mouth were completely shut, these would project beyond the teeth above them. Each of the lower grinders also advances beyond its fellow in the upper jaw. The space between the molares of the two jaws is not very great, and, in many cases, the thumb can scarcely be got between those situated furthest back. The irritation and compression of the parotid glands produce an increased secretion of the saliva, which is involuntarily discharged from the mouth. The articulation of words is difficult, and the pronunciation of syllables with the labial consonants impossible. Instead of the prominence formed by the external side of the condyle, immediately in front of the meatus auditorius externus, behind the root of the zygoma, a depression may be remarked, caused by the outer portion of the glenoid cavity of the temporal bone. The elongation of the muscles occasions a flatness of the cheeks and temples; and the projection of the coronoid process is very distinguishable through the cheek, and especially within the mouth.

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* See Loder, Chirurgisch-Med. Beobachtungen, p. 181. 8vo. Weimar, 1794. A. Cooper on Dislocations, p. 360. ed. 4.

When the case is a dislocation of only one condyle, the chin inclines to the opposite side; the lower teeth undergo a corresponding displacement; the mouth is open, but not so widely as when both condyles are out of their right places; the depression just in front of the ear, arising from the absence of the condyle, is only on the injured side; and the articulation of words is defective, but not altogether impeded. In a fat subject, or in a case which has existed some time, I can well conceive with Mr. Hey *, that the lateral inclination of the chin may not be very obvious; but, in recent cases, and in persons not too fat, I should always expect to be able to notice such displacement, as it is a change which must mechanically and immediately follow the removal of one of the condyles from the glenoid cavity, while the other continues in its right situation.

If a dislocation of the lower jaw be left unreduced, the bone remains fixed in its new situation; the saliva is involuntarily discharged from the mouth, its quantity being for some time very copious, but afterwards diminishing; mastication is totally impeded; but, if the head be drawn back, liquids can be swallowed. Examples are even mentioned, in which the unreduced jaw was rendered quite immoveable by an anchylosis. However, this is far from being always the case: Monro relates an instance, in which the patient recovered the power of elevating and depressing the jaw, without being able, however, to put the teeth completely together.† Other examples are recorded, in which the lower jaw was gradually raised sufficiently to admit of the lips being easily brought together, and made capable of hindering the escape of the spittle. Ravaton saw a recruit, in whom one of the condyles had been out of its place two years, yet he was able both to chew and speak, though with some difficulty.

For the treatment, there are two indications; viz. to reduce the bone, and to keep it reduced.

In order to accomplish the first, the patient is to be placed upon a low seat, and his head is to be supported against the breast of an assistant. The surgeon being in front of the patient, is to put his thumbs, covered with a handkerchief, or a thick pair of gloves, as far as he can betwixt the back grinders on both sides of the mouth. The fore-fingers are then to be applied to the crowns of the last lower grinders, while the body of the bone is grasped on each side with the rest of the fingers, which are to extend obliquely under its base. While the head is steadily fixed, the surgeon presses directly downwards with his thumbs, by which means the condyles are separated a little way from the anterior part of the transverse process of the temporal bone. The condyles are then to be inclined backwards and a little downwards, by pressure applied to the back

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* Practical Obs. in Surgery, p. 525.

† See also Sir A. Cooper on Dislocations, p. 359. ed. 4.

molares and the coronoid process, while the chin is inclined with the fingers upwards and forwards.

In general, as soon as the condyles slip into the glenoid cavities, the muscles suddenly shut the mouth, so that, if the surgeon were not quickly to move his thumbs towards the cheeks from between the grinding teeth, they might be injured. Hence also the prudence of protecting them with gloves. Sometimes a cork is put between the molar teeth, on each side of the mouth, and used as a fulcrum, on which the movement necessary for the reduction is effected.

According to Mr. Hey, if both sides of the jaw are pressed upon, while one side only is dislocated, the reduction is rather prevented. Therefore, before any attempt is made, he considers it best to examine carefully, whether both the condyles are dislocated, and in case one only should be out of its place, to apply force merely on the side where the displacement exists. At the same time, he is inclined to think, that, even when both condyles are out of their places, the application of pressure to one side of the jaw will not be injurious, as he has often succeeded in reducing one condyle first, and then the other, though he could not put them back both together.* The records of surgery fully prove, that dislocations of one condyle are the cases, in which the reduction is attended with most difficulty, and the nature of the accident most likely to be overlooked, or mistaken.

Should the soft parts be considerably swelled, or the violent action of the muscles frustrate the first attempts at reduction, it would be right to bleed the patient from a large opening, and even take other measures for producing temporary faintness.

The second indication, or that of keeping the bone from slipping out of its place again, is fulfilled by supporting the chin, and hindering its depression, by means of the four-tailed bandage, applied as in fractures of the lower jaw. The patient is to refrain from speaking; to live for some time on liquids; to support his chin whenever a disposition to gape is experienced; and to avoid opening his mouth wide.

DISLOCATION OF THE CLAVICLE.

Fractures of the clavicle are much more common than dislocations, as any one would infer, who considered the vast strength of the ligaments, the slender structure, and exposed position of the bone, and the direction, in which an external force would commonly operate upon it. A dislocation more readily happens at the sternal, than the scapular, extremity of the clavicle, on account of the greater degree of motion, which takes place in the former situation, and the weaker structure of the ligaments. The accident more frequently occurs in young subjects and females, in whom the articular cavity of the sternum is less deep and perfect, than in adults, or the male sex.* When a dislocation happens at the sternum, the clavicle is usually thrown forward; sometimes, however, backward; in which event, the symptoms may be severe and even dangerous, on account of the pressure produced by the bone on the parts situated in the anterior part of the neck. Thus one case is recorded, in which the patient's life was endangered by the pressure upon the †œsophagus.

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* Hey, Practical Obs. in Surgery, p. 326. ed. 2.

The dislocation of the sternal end of the clavicle forwards may arise from the sudden application of considerable force with a view of drawing back the shoulder, when the ligaments, and perhaps even a part of the lower tendon of the sterno-cleido-mastoideus muscle, are ruptured, and the inner head of the clavicle propelled forwards. It may also be produced by a fall upon the point of the shoulder, or upon the elbow, while this is separated from the side, the force in both cases pushing the clavicle inwards and forwards.

Some writers conceive, that a luxation of the inner end of the clavicle forwards may arise from a fall, by which the shoulder is forcibly driven backward. Sir Astley Cooper has never known the accident caused by violence, though he thinks it might happen from a blow on the forepart of the bone, so violent as to tear the capsular and clavicular-costal ligament. ‡ The only case seen by him was occasioned by great deformity of the spine.

A dislocation of the inner end of the clavicle forwards is reduced in the following way; the surgeon is to apply one hand to the inner and upper part of the arm, and the other to the external lower side of it above the elbow. The latter part is now to be inclined towards the trunk, while the upper end of the humerus is propelled outwards, by which means this bone is made to answer the purpose of a lever, the action of which immediately operates upon the clavicle. By these combined efforts of both hands, the shoulder is to be carried backwards and upwards, and the elbow forwards, so that the extension may be made in the oblique direction of the clavicle; that is to say, outwards, backwards, and a little upwards. The wedge-like cushion, used for fractures of this bone, is to be put under the axilla, as a point d'appui, which will tend to do permanently what the surgeon does with both his hands. However, if this extension should fail to bring the inner end of the clavicle into the articular cavity on the sternum, the reduction must be promoted by pressing the displaced part backwards. As soon as this is in its place again, the shoulder is to be inclined forwards, and the elbow backwards, in order to lessen the risk of the head of the bone slipping forwards again.§ Lastly, the arm is to be confined in the right posture over the cushion by means of a roller, applied round the limb and trunk, together, and the elbow and forearm are to be well supported in a sling.

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* Boyer, Traité des Maladies Chir. t. iv. p. 156.

† A. Cooper, Surgical Essays, Part i. p. 14.

‡ On Dislocations, p. 569. ed. 4.

§ Boyer, vol. cit. p. 161.

The dislocation of the scapular end of the clavicle is always upwards; for, the root of the coracoid process will not allow the bone to descend below the acromion. The accident is generally the consequence of a violent fall upon the shoulder, by which the scapula is forced inwards. The displacement, however, cannot happen, unless the ligaments tying the bones together be torn, and even some of those ligamentous bands, which connect the clavicle to the coracoid process. The case may be mistaken for a fracture of the clavicle.

The treatment recommended by Sir Astley Cooper, is as follows: an assistant puts his knee between the patient's shoulders, and draws them backwards and upwards, whereby the clavicle is made to descend into its place again. A thick cushion is then put in each armpit; first, to keep the scapula from the side; secondly to raise it; and thirdly to hinder the margins of the axillæ from being hurt by the bandages. The shoulder is then confined inwards and backwards with a bandage, the elbow being kept well up in a sling, and at the same time inclined backwards.* It appears to me, that the apparatus for keeping the end of the bone in its place should act in the same manner, as the power which effected the reduction; consequently, it should depress the outer end of the clavicle, raise the shoulder, incline it outwards, and hold the arm steadily against the side.

DISLOCATIONS OF THE SHOULDER.

No bone in the body is so frequently dislocated as the humerus; a circumstance ascribable to the shallowness of the glenoid cavity of the scapula, the looseness of the capsular ligament, the varied and extensive movements of which the arm is capable, and the force of the impulse transmitted to the head of the bone in falls and other accidents, through so long a lever as is formed by the whole limb, or even by the humerus alone. However, nature has provided some guards against the accident. In the first place, the coracoid process, the acromion, and the triangular ligament connecting these parts together, form above the glenoid cavity a kind of arch, which receives a part of the head of the humerus, and retains it in its situation, when the arm is impelled from below upwards. Secondly, as the glenoid cavity is of an oval shape, with its greatest diameter placed vertically, the elevation of the arm, the movement most frequently causing a luxation, may take place to a considerable extent, without the head of the bone, which then glides from above downwards in the glenoid cavity, ceasing to remain in contact with it.

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* On Dislocations, p. 375.

Thirdly, the tendon of the subscapularis muscle at the inner and forepart of the joint, that of the supra-spinatus above, and those of the infra-spinatus and teres minor below and behind, adhere so intimately to the capsular ligament, are so truly blended with it, and so connected with each other by dense cellular substance, that they constitute a very firm investment, well suited for resisting in a certain degree every displacement of the humerus at the points which they occupy. Fourthly, the movements of the arm do not altogether depend upon the shoulder-joint, but in a great measure upon the mobility of the scapula, which always moves together with the humerus and in the same direction: thus, in the most extensive motions of the arm, the humerus is rarely placed in a sufficiently oblique position upon the scapula to produce a dislocation. But, notwithstanding these many contrivances for strengthening the shoulder-joint, and lessening the risk of luxations of the humerus by the impulses to which it is subjected, experience proves, that these cases are very frequent, and upon an average as numerous as all other dislocations together.*

The dislocation of the head of the humerus *downwards* into the axilla is the most common, and it would even be more frequent than it is, were it not that the elevation of the arm, by which the head of the bone is inclined downwards, is not the most common movement of the limb; and that a sufficiently oblique position of the bone on the glenoid cavity for a dislocation to happen, is usually prevented by the scapula following and adapting itself to all the movements of the humerus.

In the dislocation downwards, the arm is lengthened, the elbow separated from the side, and the forearm generally extended in consequence of the tension of the triceps muscle; the arm cannot be put near the body, nor the forearm be bent without pain; the acromion projects more than natural, and a vacancy is distinguishable under it; the fulness of the shoulder is lost, the deltoid muscle not being now duly supported by the head of the bone; the arm cannot be raised to a level with the acromion; and, when the elbow is considerably raised from the side, the head of the bone can be plainly felt in the axilla.

When the head of the humerus is thrown downwards, as is most frequently the case, it lies upon a very limited surface, quite disproportionate to its size. Hence, any exertion, or impulse, the weight of the limb itself, and the action of the muscles, are likely to produce another change in its situation. Boyer, who has had several opportunities of dissecting shoulders, dislocated downwards, has invariably found the head of the bone situated between the long head of the triceps, and the subscapularis muscle, resting upon the inside of the front edge of the scapula.† In one case, dissected by Sir

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* Boyer, Traité des Maladies Chir. tom. iv. pp. 174, 175.

† Vol. cit. p. 185.

Astley Cooper, the head of the bone was pushed backwards upon the subscapularis: and, in another instance, it rested upon the axillary plexus of nerves and the artery.*

The dislocation into the axilla frequently happens from falls, in which the elbow strikes against the ground, while separated from the side of the trunk. When a person falls sideways, he naturally puts out his arm in order to hinder his head from striking the ground. In this situation, the weight of the body is upon the shoulder-joint; and as, at the same instant, the pectoralis major, latissimus dorsi, and teres major, act strongly and pull the arm forcibly towards the chest, they make the head of the humerus slip out of its cavity, because the elbow rests upon the ground as a fixed point, while the upper end of the bone is the moveable one.

On many occasions, however, the head of the humerus is dislocated downwards, not exactly in the foregoing manner; thus the arm of an ostler, as he is putting on a bridle, may be dislocated by the horse suddenly throwing up its head, and striking the under part of the elbow, while raised from the side of the body. In this last instance, the lower end of the humerus is violently thrown up, and its head propelled down into the axilla, the movement being like that of a lever.

The records of surgery furnish proofs, also, that the humerus may be luxated solely by the action of the muscles, without any fall, or external violence being concerned in producing the accident; for, cases are related, in which the arm was dislocated into the axilla by merely lifting up a weight, or by the convulsed action of the muscles in attacks of epilepsy.†

In cases of dislocation of the shoulder, the capsular ligament is extensively torn; and one remark is made by Boyer, which is of importance, viz. that in dissections he has constantly found the lacerated opening in the capsule quite large enough to allow of the easy return of the head of the bone into its natural situation. This observation, which is at variance with the statements of Desault, agrees with the remarks of Sir Astley Cooper.‡

In the dislocation downwards, the tendon of the subscapularis is ruptured. The tendons of the supra and infraspinatus muscles may likewise be torn from the bone, and with them a shell of the head of the humerus may be detached.§ Writers do not agree in their accounts of what becomes of the tendon of the long head of the biceps. According to some reports, it is displaced from its groove; according to others, it is actually ruptured. Mr. Hey tells us, that he once saw a compound dislocation of the os humeri, where the head of the bone protruded through the integuments in the axilla; and, in this case, the long tendon of the biceps was torn from its groove in the neck of the bone. However, it may be inferred, that, in ordinary dislocations downwards, this tendon is neither torn, nor displaced from its groove; for, Boyer has never seen either occurrence in the cases which he has dissected*; and Sir Astley Cooper says that, as far as he has had an opportunity of judging from dissection, the same tendon remains unbroken. †

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* On Dislocations, pp. 386—388.

† Boyer, Traité des Maladies des Os, tom iv, pp. 181, 182.

‡ Surgical Essays, Part i. p. 18. Thompson found the capsular ligament entirely torn off from the neck of the humerus. See Med. Obs. and Inquiries.

§ Thompson, in Medical Obs. and Inquiries, and Hey's Practical Obs. p. 311, ed. 2.

The dislocation next in frequency to that downwards, is the case, in which the head of the humerus breaks through the internal portion of the capsular ligament, and passes forwards immediately under the great pectoral muscle, where it lies below the middle of the clavicle, and on the sternal side of the coracoid process.

This dislocation inwards generally happens as follows; when the arm is raised so as to form nearly a right angle with the trunk, and the elbow is inclined backwards, a fall on the side may drive the head of the humerus through the inner part of the capsular ligament. However, the resistance of the ground operates very obliquely upon the elbow, and consequently, a great part of the violence is lost: hence, one reason, why the dislocation inwards is less commonly met with than that downwards.

In the dislocation inwards, the arm is somewhat shortened; the direction of the arm is downwards and backwards; the flatness of the shoulder, and the depression formed by the glenoid cavity, are very obvious; the head of the humerus can be felt under the clavicle, on the inner side of the coracoid process; and lastly, the elbow is thrown more from the side, and further back, than in the dislocation into the axilla. ‡

Many surgical authors believe, that the head of the humerus cannot be dislocated backwards. "No force," says Mr. C. Bell, "can be applied in a direction to dislocate the humerus, and push its head behind the scapula, for this very evident reason, that the chest prevents the necessary position of the humerus." § But, though an accident of this description is very uncommon, all such writers as absolutely deny its possibility, are themselves venturing beyond the bounds of accuracy. A few cases, in which the head of the humerus was dislocated backwards under the spine of the scapula, may now be found in the voluminous records of the profession. Thus, M. Fizeau ‖ has detailed one rare instance, which was also witnessed by Boyer; the bone, after its reduction, had a remarkable tendency to slip out of its place again; which led the latter surgeon to suppose that there was some malformation of the joint. As, however, a disposition to relapse is more or less common after all luxations of the shoulder, it does not appear to me, that there was any strong reason for the foregoing suspicion, especially as there are other cases to be met with of a similar displacement, unaccompanied with any ground for such a conjecture. I have said, that, in this uncommon kind of luxation the head of the bone is lodged under the spine of the scapula: and in one case dissected by Delpech, the head of the bone lay under the infraspinatus muscle, in immediate contact with the scapula.* Some other cases of dislocation backwards are reported by Sir Astley Cooper.†

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* Traité des Maladies Chir. t. iv. p. 186.

† Surgical Essays, Part i. p. 5.

‡ Sir A. Cooper, on Dislocation, p. 399, ed. 4.

§ Operative Surgery, vol. ii. p. 239.

‖ Journal de Medecine, Chirurgie, Pharmacie, &c. par M. M. Corvisart, Le Roux, Boyer, &c. tom. x. p. 386.

The head of the humerus is sometimes dislocated by violence directly applied to the shoulder, and, according to Boyer, in all cases of this sort, either the scapula or the humerus is also fractured. The particulars of a dislocation of the humerus backwards, produced in this manner, and attended with a fracture of the anatomical neck of the bone, were not long ago communicated to Boyer by Dr. Houzelot, of Meaux, and the first of these gentlemen has in his possession two drawings of the case, taken from nature by one of his pupils.‡ A specimen of a dislocation of the os humeri, with fracture of the head of that bone, may be seen in the museum at St. Thomas's hospital.§

Paralysis of the arm is sometimes the consequence of a dislocation downwards, or inwards, and is supposed to proceed from injury done to the axillary plexus of nerves by the head of the humerus. The paralytic affection may remain forever incurable, may get well spontaneously, or yield to stimulating liniments, blisters, issues, or the moxa. A still more frequent ill-effect of luxations of the shoulder is paralysis of the deltoid muscle; an infirmity, ascribed by some writers to laceration of the circumflex nerve.‖

Many of the old methods of reducing dislocations of the shoulder consisted altogether of means, which acted directly upon the head of the humerus, and operated upon the principle of impelling it back into the glenoid cavity by the shortest and straightest route, without the least regard to intervening impediments. In most of these plans, either a fulcrum or an active force was applied in the axilla, and the weight of the body was then employed, as a means of propelling the head of the bone upwards, the arm being kept in a vertical position, parallel to the axis of the body. Here, it is plain, that no attempt was made to separate the head of the humerus from the lower edge of the scapula, previously to the effort to get it back into the glenoid cavity; and two of the most important principles in the reduction of dislocations in general were totally neglected, as neither extension, nor counter-extension, was practised. If it sometimes happened, that with force thus unskilfully exerted, dislocations downwards were reduced, the same practice offered no chance of success in other instances, in which the head of the humerus was either primitively or consecutively displaced inwards and forwards. In the above mode of proceeding, as the arm was placed by the side, and the shoulder drawn downwards by the weight of the whole body, the displacement in the latter kind of luxation could not fail to be increased, all the force operating upon the soft parts surrounding the head of the bone, or on the neck of the scapula, or upper portion of the humerus itself. Hence, violent contusion, lacerations, and fractures, were not unfrequently produced.

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* Précis des Maladies reputées Chirurgicales, tom. iii. p. 72.

† On Dislocations, p. 403, &c.

‡ Boyer, Traité des Maladies Chirurgicales, tom. iv. p. 183.

§ A. Cooper's Surgical Essays, Part i. p. 12.

‖ Delpech, Précis des Maladies Chir. t. iii. p. 73.

However, there can be no doubt, that the methods, which aimed directly at the reduction, without any previous extension and counter-extension, sometimes answered, or the common sense of the world would not have permitted the practice to have gone on for many ages. But, success was probably only attained, when the dislocation was downwards, the head of the humerus far removed from the glenoid cavity, and little opposition made by the muscles, the patient being either in liquor, or exhausted with fatigue. Once, as Boyer was handling the humerus of a drunken postillion, and the assistants were preparing the apparatus for reduction, the bone slipped into its place again, without any extension or counter-extension.* Even when patients are neither faint, debilitated, nor under the influence of strong drink, if the head of the humerus be in the axilla, the reduction may sometimes be executed with a very trivial degree of extension. Thus, in the case of a corpulent woman, whose shoulder was dislocated downwards, as Mr. Hey was directing the assistants to keep the arm elevated at a right angle with the body, previously to beginning the extension, they put the arm a little upon the stretch, and on pressing on the head of the bone with his fingers in the axilla, the reduction was unexpectedly accomplished.† The same excellent practitioner once saw a luxated shoulder reduced by the mere efforts of the patient: this was an instance, in which the hand was accidentally placed on the back of a low chair, while the patient was moving his body about in different directions.‡

The ambi of Hippocrates was unquestionably a better means of reduction, than the door, or ladder-process; but from the account of it delivered in the Dictionary, the reader will perceive, that the ambi made only insufficient extension, its operation being that of a lever, by which the head of the bone was raised very nearly in a direct line upwards, and but in a little degree outwards, while nothing was done in the way of counter-extension, either with regard to the trunk, or the scapula. The old mode of reduction, effected by placing the heel in the axilla, and making extension at the wrist, is to be regarded as the best of the ancient methods. The heel makes a fulcrum, on which the head of the humerus may be moved out by approximating the elbow to the side; the heel also serves for fixing the trunk, in lieu of the usual mode of counter-extension; and the surgeon himself makes extension at the wrist. It is a practice, however, which Sir Astley Cooper speaks of in favourable terms; indeed, he generally reduces a dislocation of the shoulder by placing his heel in the axilla, and drawing the arm at the wrist, in a line with the side of the body; and he states one reason for choosing to make the extension in this manner; viz. that when the arm is placed close by the side, the pectoralis major and latissimus dorsi muscles are relaxed, and cannot make so much resistance, as when the arm is carried from the side.*

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* Traité des Maladies Chirurgicales, t. iv. p 196.

† See Hey's Practical Observations in Surgery, p. 295. also the case p. 296. ed. 2.

‡ Op. cit. p. 297.

Notwithstanding the records of surgery afford numerous proofs of the occasionally ready and spontaneous reduction of the dislocated humerus, the surgeon must not expect the generality of cases to be rectified with the facility which happened in the examples already cited from the practice of Baron Boyer and Mr. Hey. On the contrary, it will be necessary to establish certain principles, without due attention to which the strongest efforts may sometimes fail.

As a general principle, then, I may assert with Boyer, that extension and counter-extension make an essential part of every unobjectionable process for the reduction of dislocations of the shoulder. In France, the extending force is usually applied to the wrist; in this country, just above the condyles of the humerus. † The counter-extension embraces two objects, viz. that of fixing the trunk, and that of preventing the scapula from yielding in the direction of the extending power.

The trunk is usually fixed by means of a sheet, or table cloth, put round the chest, and the ends of which are either held by one or more assistants, or fastened to a post, or any other immoveable point. The scapula may be kept back either by an assistant pressing against the acromion, and scapular end of the clavicle, or with a napkin folded longitudinally, applied over the same parts, and drawn in the opposite direction to that of the extending force.

Whether the extension be made at the wrist, or at the lower end of the humerus, the soft parts should be protected from the effects of the pressure with flannel, or a few turns of a wet calico-roller, over which the longitudinally folded table-cloth or sheet, or the quilted leather of the multiplied pulley employed for making the extension, may be placed.

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* See also "Cases with Observations on Wry-neck; and the Reduction of Luxations of the Shoulder-Joint, &c. &c." by John Kirby, 8vo. Lond. 1819.

† One advantage of applying the extending force above the elbow, is the opportunity of relaxing the biceps; for, "since that muscle is attached to the neck and coracoid process of the scapula, an extended state of the arm must hinder the repressing of the articular cavity." Hey's Practical Observations in Surgery, p. 300.

Nothing can be more vague and confused, than the instructions offered in the latest practical works, respecting the direction, in which the extension ought to be made. One principle, however, is never to be forgotten, as it is a most useful guide: viz. the first design should not be to force the head of the humerus towards the glenoid cavity, but to extricate it from below the neck, or costa of the scapula, or from the track which it has taken underneath the pectoral muscle, so that the intervening parts may not constitute an impediment, which cannot be overcome without great violence, and unnecessary injury.

According to Boyer, when the dislocation is downwards, the extension should be made directly outwards, and the arm afterwards inclined downwards and a little forwards, until it touches the side. The surgeon must be careful to guide the movement, by which the assistants change the direction of the extension; and, in proportion as the wrist is inclined downwards, he is to press with his abdomen on the external side of the elbow, while, with both his hands, applied to the inner and upper part of the humerus, he inclines the head of the bone upwards and a little backwards. The success of these manœuvres will depend in a great measure upon the extension and counter-extension being well proportioned to each other, and regulated so as to promote the movements, which it is the duty of the surgeon to communicate to the limb during the operation.

When the dislocation is inwards, Boyer recommends the extension to be made horizontally outwards and a little backwards; and the limb is afterwards to be inclined forwards and downwards, until brought obliquely over the front of the chest. But, previously to the limb reaching the last position, the operator is to press with one of his hands upon the back of the elbow, and, with the other, upon the front and upper part of the humerus, in order to push the head of the bone outwards, and direct it into the glenoid cavity of the scapula.*

When the head of the bone has quitted the axilla, and slipped under the pectoral muscle, Mr. Hey has observed, that it is brought back into the axilla more readily, if the extension be made in a direction opposite to that in which it has passed from the axilla; and that success is often greatly promoted by making the extension with the arm elevated. But when the head of the bone has advanced far under the pectoral muscle, he conceives, that strong extension may sometimes hinder the reduction by closing the passage, through which the head of the bone should return, and, in such cases, he is an advocate for combining moderate extension, with the plan of moving the head of the bone freely about in all directions, pressure being also employed at the proper crisis for inclining it towards the glenoid cavity. †

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* Boyer, Traité des Maladies Chir. tom. iv. pp. 203—205.

† Practical Obs. in Surgery, p. 311, &c. ed. 2.

Mr. Hey has noticed the occasional impediment to reduction caused by the pressure of the edge of the glenoid cavity against the neck of the humerus. If the extension be made horizontally, the hindrance, he observes, will be increased, in proportion to the depression of the acromion. In order to obviate the difficulty, he says, the head of the humerus must be lowered by elevating the arm, while the edge of the glenoid cavity must be separated from the humerus by repressing the acromion.

Whether the extending force be applied in the French manner to the wrist, or (as is generally done in this country) just above the elbow, the position and inclination of the humerus during the operation should be the same. In short, while the extension and counter-extension are kept up by the assistants, the limb, or the humerus itself, is to be employed by the surgeon as a lever for moving the head of the bone gradually towards the glenoid cavity. In Boyer's account, we see, that this principle is acted upon, the elbow and wrist being inclined in particular directions, while the surgeon forms with his hands a kind of fulcrum, or active resistance at the upper part of the humerus. When the extension has been performed in a certain degree, many surgeons make a still more efficient fulcrum by directing one of the assistants to draw up the upper portion of the humerus with a towel placed under the limb just on the outside of the axilla. Others execute the same purpose by letting the ends of the towel, or table-cloth, be fastened over the back part of their necks, which they draw back at the period, when it is desired to keep well up the superior portion of the humerus.

An excellent general rule in reducing dislocated shoulders, is to make the extension in a gradual, regular, and unremitting manner, without immoderate, sudden violence. In this way, the muscles of the most athletic man may be overcome, while extension, so powerful as to be attended with risk of tearing the flesh, will fail, if not maintained for a certain time without the slightest relaxation. When the head of the bone has been brought near the glenoid cavity, the extending force should always be gradually lessened, as the lever-movement of the limb, and the action of the muscles themselves, are then the means, by which the head of the bone will be replaced.

According to Boyer, when the head of the humerus has been dislocated a month, or six weeks, its reduction is seldom practicable. But, as experience proves, that the bone has been sometimes replaced at a much later period, it would be culpable not to make the attempt. A practical writer informs us, that he has in some cases reduced the humerus, after it had been dislocated two or three months, and, in one example, six months after the accident.*

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* John Kirby, Cases, with Observations on Wry-neck; the Reduction of Luxations of the Shoulder, &c. p. 53. 8vo. Lond. 1819.

Although I believe the employment of pulleys commendable in the hands of a skilful and prudent surgeon, and, in cases where force must be used, am inclined to prefer them to other extending means, they unquestionably require caution, lest the force exerted be such as to cause a danger of the soft parts being torn, the axillary artery ruptured, or the limb so much hurt that the risk of mortification is incurred. When Loder was studying at the Hôtel-Dieu at Rouen, a man came to the hospital, on account of some trifling complaint. M. David, the principal surgeon, perceived that the patient had also a dislocation of the left arm, which in fact had existed several months. M. David recommended a fresh trial to reduce the bone; the attempt was made with immense force, and the arm restored to its proper place again; but, the event was most disastrous, for the whole limb was attacked with such violent pain and inflammation, that, notwithstanding every means which surgery could suggest, mortification ensued, and the patient lost his life.*

To prevent the head of the humerus from slipping out of its place again, (a tendency which always lasts for two or three weeks after the reduction,) a sling should be worn, and the arm kept close to the side.

When a dislocation is accompanied with a fracture of the humerus, the reduction is generally impracticable, especially if the solution of continuity in the bone happen to be very near the shoulder-joint. However, Delpech mentions one instance, in which a fracture of the neck of a dislocated humerus did not prevent the reduction, which was accomplished by means of a tourniquet applied over the shoulder and under the head of the bone.†

DISLOCATIONS OF THE ELBOW.

The bones of the fore-arm can hardly be thrown forwards, without the olecranon being broken, and probably its resistance is one principal reason why such a displacement is very uncommon.‡ The kind of dislocation, most frequent at the elbow, is that in which the upper heads of the radius and ulna are displaced backward. Its occurrence is facilitated by the small size of the coronoid process, which slips behind the os humeri into the lower portion of the cavity, naturally destined for the reception of the olecranon in the extended state of the forearm. In some instances, the coronoid process is fractured; a complication which is said not to admit of the ulna being preserved in its natural situation. § The lower end of the humerus is situated upon the anterior surface of the radius and ulna, between the coronoid process and the insertion of the tendon of the biceps muscle; and the lateral ligaments are torn. The brachialis is excessively stretched. The olecranon and part of the triceps project backward to an unusual distance, causing an appearance, as if the arm were broken above its lower third. The biceps, pronator teres, supinator brevis, and triceps, are all in a state of tension; and, in consequence of the forearm being thus drawn in opposite directions by the antagonist muscles, it remains in a half-bent position. Sometimes the displacement is much more extensive, and the injury of the soft parts greater. Thus, the lower end of the humerus may be thrown further from the elbow, along the anterior surface of the radius and ulna, which displacement cannot happen without the laceration of several of the preceding muscles. In cases of this description, the humerus has sometimes been driven through the integuments, and even the brachial artery has been ruptured.*

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* Chir. Med. Beobachtungen, p. 173. 8vo. Weimar, 1794.

† Précis des Maladies reputées Chirurgicales, tom. iii. p. 80.

‡ Only a single instance of this luxation, unaccompanied with fracture of th olecranon, is said to be upon record. Delpech, vol. cit. p. 81.

§ Sir A. Cooper, Surgical Essays, Part i. p. 12.

The next most frequent dislocation at the elbow consists in the ulna being pushed into the place of the radius upon the lower end of the humerus. In this case, the olecranon is brought nearer to the external condyle, the distance between the olecranon and internal condyle being of course much greater than natural. From the perusal of books, one might suppose that all dislocations at the elbow were so obvious, as not to admit of the possibility of mistake. However, this is far from being true; for, such accidents are rarely produced without great violence, the usual consequence of which, is a rapid and considerable swelling, by which the form of the joint is very much concealed. I have seen several cases where the patients were permanently crippled, because the nature of the accidents had not been understood at first, and no attempt at reduction made. One common cause of mistake is the feel of a crepitus, when the forearm is moved, and the surgeon is led by this circumstance to suppose the case a fracture; but, he should remember, that most dislocations at the elbow are attended, as well as fractures, with this symptom. I once saw a young gentleman whose ulna had been pushed on the external condyle about a month, yet the efforts of two very eminent surgeons in London could not now produce the slightest diminution of the displacement.

In the lateral dislocation of the head of the ulna outwards, the radius is forced off the lesser articular surface of the humerus; this surface and the outer side of the articular pulley being now in contact with the sigmoid cavity of the ulna. The internal portion of the trochlea of the humerus is no longer applied to the ulna, and forms a prominence at the inner side of the elbow, while the olecranon and coronoid process, being propelled outwards, do not correspond to the cavities in the humerus naturally intended for their reception; and hence, they seriously limit the flexion and extension of the forearm. As the point of the olecranon constantly touches the back of the humerus, the forearm remains slightly bent; and the brachialis, biceps, and triceps, are in a state of tension. A similar condition of the pronator teres and of nearly all the muscles situated on the palmar side of the forearm, will also explain the fixed pronation of the hand, and the bent state of the fingers.*

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* Delpech, vol. cit. p. 82.

The lateral dislocation of the heads of the ulna and radius inwards is more uncommon and generally incomplete. The student will recollect, that by the term *incomplete*, in reference to luxations, surgeons mean that the articular surfaces are still in partial contact; a state, which is well accounted for, in lateral dislocations of the elbow, by the great extent of the surfaces of this joint in the transverse direction. In the dislocation inwards, the upper head of the radius is thrown upon the trochlea of the humerus, and more or less of the sigmoid cavity of the ulna is forced away from the latter bone, and forms a projection at the inside of the elbow. The olecranon and coronoid process being now placed more internally, than the depressions destined for them in the humerus, cannot freely execute their usual movements, more especially the olecranon, which being the longest of the two, keeps the arm constantly bent, though in a less degree than in the lateral dislocation outwards. The short supinator, being on the stretch, rotates the radius outwards; while the brachialis, biceps, and triceps, are displaced inwards and very prominent. Lastly, the olecranon is nearer the inner condyle, than natural. Lateral dislocations of the upper heads of the radius and ulna are always attended with rupture of the lateral ligaments, and generally also with a laceration of the annular ligament of the radius which is so intimately connected with the external lateral ligament, as to be as it were a part or production of it. That it is frequently torn, is proved by the fact, that after a lateral dislocation of the elbow has been reduced, it is not at all uncommon for the surgeon to perceive a distinct luxation of the radius yet claiming his assistance. And, as Delpech observes, the radius and ulna can only preserve their due relation to each other in dislocations of the elbow, when the external lateral ligament happens to break above its connection with the annular ligament.

Besides the kinds of luxation at the elbow already specified, the ulna alone may be dislocated, or the radius luxated either forwards or backwards, without any displacement of the ulna. Examples also sometimes occur, in which the radius is driven forwards, and the ulna backwards, with or without a fracture of the coronoid process.

When proper extension is made, recent dislocations of the elbow are easily reduced. In the luxation of the ulna and radius backwards, an assistant is to take hold of the arm, and fix the humerus, while another makes extension at the wrist in the axis of the forearm. Then the surgeon slowly bends the elbow, and the reduction immediately follows.

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* Delpech, Précis Elémentaire des Maladies Chirurgicales, tom iii. p. 83.

The arm should afterwards be kept in a sling; and if there be much swelling, venesection, leeches, cold washes, low diet, and purging, will be proper. The tendency to displacement is slight; but if, from the separation of the articular surfaces having been greater than usual, and attended with extensive laceration of the ligaments and muscles, and fracture of the coronoid process, the joint should require mechanical support, it must be obtained from the use of a bandage, compresses, and a splint for preserving the radius motionless. In general, however, the pressure of any apparatus is injurious while inflammation is present, and afterwards it becomes unnecessary, with any view to the prevention of another displacement. In about a fortnight, when the inflammation and swelling have subsided, the forearm should sometimes be gently bent and extended, in order to hinder anchylosis.

DISLOCATIONS OF THE METACARPAL BONE OF THE THUMB FROM THE OS TRAPEZIUM.

From the various directions in which the metacarpal bone of the thumb is moveable, it seems capable of being dislocated off the trapezium either backwards, forwards, inwards, or outwards; the first and third forms of the accident, however, are the most common. The usual cause of the first is external violence, by which the metacarpal bone is suddenly and immoderately bent towards the palm, as may occur in a fall upon the radial edge of the hand.

The nature of the accident may be known by the tumour formed by the displaced head of the bone; by the flexion of the thumb and metacarpal bone; by the impossibility of extending them; and the pain accompanying every such attempt. The considerable swelling, which soon follows, sometimes obscures the case; and if, in this circumstance, the surgeon merely adopt measures for the removal of the inflammation, the bone either becomes in a short time irreducible, or, if reducible, a permanent tendency to slip out of its place again is left, — the effect of the consolidation of the capsular ligament, while the bone was in a state of displacement.

The reduction of a dislocation of the metacarpal bone of the thumb backwards is accomplished as follows: while one assistant pulls the thumb, and another fixes the hand, by taking hold of the wrist, the surgeon compresses with both his thumbs the displaced head of the bone, and pushes it towards the palm into its natural situation again. Some linen wet with the liquor plumbi acetatis dilutus may then be applied round the part, and a return of the displacement is to be prevented by laying a compress and piece of strong pasteboard along the posterior surface of the bone, properly secured with tape.*

In the cases, which Sir Astley Cooper met with, the head of the metacarpal bone was forced inwards, between the trapezium and metacarpal bone of the fore-finger, so as to make a protuberance towards the palm; the thumb was inclined backwards, and could not be brought towards the little finger. In the reduction, the extension must be kept up a considerable time, and then the thumb moved towards the palm.†

DISLOCATIONS OF THE THUMB.

With respect to these cases, I am anxious to notice a few particulars, not explained in the Dictionary.

The phalanges of the thumb are most liable to be dislocated backwards, and, in certain individuals, the tendency to this kind of displacement is so considerable, that they can produce and remove it at pleasure by the mere contraction of the muscles. In a letter, dated the 6th of February, 1819, and received by me from Mr. Dunn, an intelligent surgeon now settled at Scarborough, (to whom I here beg leave to acknowledge my obligations for many other valuable communications,) he says, " my pupil, who has written this copy of my letter to you, can spontaneously dislocate the thumb of his left hand at the metacarpal joint by the action of the flexors alone, the metacarpal bone being the upper. By the action of the extensors, he can again replace it; but, the least extension of the thumb by an assistant, or himself, gives him great pain, without accomplishing the reduction. He can by the same means dislocate the second phalanx of the thumb from the first. He complains of no weakness in his hand, and, indeed, can exercise the left hand better than the right." Boyer tells us, that he has met with several persons, in whom the first phalanx of the thumb had this tendency to slip backwards; and he professes his inability to say, whether it depended upon relaxation of the ligaments, or particular conformation of the articular surfaces.‡

The first phalanx of the thumb is apt to be dislocated backward by immoderate extension of the joint. The base of the phalanx glides backward behind the head of the first metacarpal bone, lacerating the capsular ligament, stretching the tendons of the extensor muscles, and changing the direction of the lateral ligaments, without breaking them.

The nature of the case may be known by the head of the first phalanx of the thumb projecting back, so as to form nearly a right angle with the metacarpal bone; by the tumour produced in front of the joint by the head of the latter bone; by the bent position of the second phalanx caused by the tense state of the tendon of the flexor longus pollicis; and by the impossibility of either bending or extending the first phalanx.

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* Boyer, Traité des Maladies Chirurgicales, tom. iv. p. 268.

† On Dislocations, &c. p. 489.

‡ Boyer, Traité des Maladies Chir. tom. iv. p. 273.

In many surgical books, the reduction of the first phalanx of the thumb, when thrown backwards off the head of the metacarpal bone, is described as attended with no difficulty, when done soon after the occurrence of the accident; but, all writers agree, that if the case be neglected, it quickly becomes irreducible.

With regard to the general facility of reduction in an earlier stage, modern experience proves, that even this is far from being the truth; and, according to the observations of the late Mr. Hey *, a peculiar difficulty attends the reduction, whenever the head of the metacarpal bone, which is joined to the first phalanx of the thumb, is completely luxated, and depressed towards the palm of the hand. He informs us, that, when he was a pupil at St. George's hospital, in 1758, a patient with such an accident was dismissed incurable; Mr. Bromfield at the same time stating to the pupils another instance, in which the extending force had been increased to such a degree, that the surgeon tore off the thumb at the second joint. Nor could Mr. Hey himself, by means of extension and pressure, or twisting the bone about, accomplish the reduction of a similar case, which was brought to him by another surgeon in 1767.

The cause of the difficulty in the reduction is variously explained by different writers. Boyer refers it partly to the little space which the thumb presents for the counter-extension, and partly to the resistance made by the strong muscles around the joint. † On the contrary, Mr. Hey, in endeavouring to account for the impediment, adverts to the wedge-like shape of a transverse section of the head of the metacarpal bone, with the narrowest part towards the palm of the hand, and makes some reflections on the effect of the position of the tubercles situated upon the head of the same bone, the two nearest the palm being only 3-8ths of an inch from each other, while those towards the back of the bone have an interspace of 5-8ths of an inch. Supposing, therefore, the head of the metacarpal bone to be pressed forcibly between the lateral ligaments, towards the palm of the hand, it passes like a wedge between these ligaments; and having passed between them, it cannot return, as the posterior broad part of the bone presents itself to the more contracted aperture between them. In some dislocations of the foregoing kind, which came under Mr. Hey's management subsequently to the publication of his first edition, he succeeded in reducing the bone by pressure without extension. The pressure should be made against the luxated extremity of the first phalanx, which lies upon the back part of the metacarpal bone. ‡

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* Practical Obs. in Surgery, p. 327. edit. 2.

† Traité des Maladies Chir. tom. iv. p. 274.

‡ Hey's Practical Observations in Surgery, pp. 327—329. edit. 2.

In one instance, where a dislocation of the first phalanx of the thumb backwards from the metacarpal bone had continued about twelve days, and could not be reduced, Desault recommended an incision to be made behind the extremity of the luxated bone of the thumb, and a spatula, or some other lever, to be introduced for the purpose of effecting the reduction. This suggestion, however, was not adopted. Mr. Evans, of Ketley, near Wellington in Shropshire, met with two cases of dislocation of the metacarpal bone towards the palm of the hand, and, in both these examples, the reduction could not be performed with extension, notwithstanding repeated trials were made. Mr. Evans was therefore induced to cut down upon the end of the bone, thrust it out of the wound, and saw it off. In both cases, the reduction was then effected with the greatest facility. The wound was immediately closed, the parts united favourably, and nearly the perfect use of the thumbs was recovered.*

Instead of the preceding method of treatment, were I to meet with a case, which could not be reduced in the manner advised by Mr. Hey, I should prefer following Mr. C. Bell's suggestion, which is to insinuate a couching needle obliquely under the skin, and divide with it one of the lateral ligaments, which form the main difficulty to reduction by their embracing the head of the bone. †

Although extension made precisely in the line of the axis of the two phalanges of the thumb must tend to lock the head of the first phalanx still more firmly, it appears to me, that, if it were made so as to incline the latter bone towards the palm of the hand, it might contribute to facilitate the effect of direct pressure on the head of the displaced phalanx. Thus Boyer, after injudiciously recommending straight extension, finishes with a more useful piece of advice; "As soon as the surgeon perceives, that the dislocated phalanx yields to the extending force, he is to press upon the base of the phalanx with both his thumbs, and push it forwards and downwards, while the assistant, who makes the extension, inclines this phalanx into the bent position." ‡

My friend, Mr. Carwardine, met with a case of compound luxation of the anterior head of the first phalanx of the thumb, the posterior head of the second phalanx was left resting upon the back of the first phalanx, while the extremity of the thumb stood upright. After repeated fruitless attempts at reduction by means of extension, he succeeded by pushing forwards that extremity of the second phalanx, which rested upon the first, until he had brought the articulating surfaces into contact. He then turned the second phalanx round the projecting extremity of the first, and easily accomplished the reduction. §

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* Hey's Practical Observations in Surgery, p. 530.

† Operative Surgery, vol. ii. p. 261.

‡ Traité des Maladies Chir. t. iv. p. 274.

§ See Hey's Practical Obs. p. 531.

Sir Astley Cooper puts a thin piece of wet wash-leather round the first phalanx; then applies a tape, about two yards long, fixing it with the clove-hitch notch; an assistant makes counter-extension; and the extension is made with the tape. When this plan fails, the multiplied pulley is employed.*

DISLOCATIONS OF THE THIGH-BONE AT THE HIP.

Dislocations of the thigh-bone at the hip-joint are of four kinds. In the first, the head of the bone is thrown upon the obturator foramen; in the second, into the upper part of the groin upon the os pubis; in the third, upon the dorsum of the ilium; and, in the fourth, upon the sacro-ischiatic notch.

Whatever may be the point of the brim of the acetabulum, over which the head of the bone escapes from that cavity, the displacement can never happen without producing a laceration of the capsular ligament. † In the dislocation upon the obturator foramen, perhaps the ligamentum teres may not always be ruptured ‡; but, in other examples, it is almost invariably lacerated §; and it is even sometimes broken in the luxation upon the obturator foramen, as is put out of all doubt by a preparation in the Collection at St. Thomas's hospital. Indeed, Sir Astley Cooper states, that this is always the case, because the dislocation happens whilst the thighs are widely separated, and the ligamentum teres on the stretch, which is ruptured before the head of the bone is quite out of the acetabulum.* He differs, therefore, from Boyer, who states that the ligamentum teres is ruptured only when the head of the bone is very extensively displaced.†

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* On Dislocations, p. 494.

† This statement, with respect to all common cases, I believe to be correct: but there are certain cases, which form exceptions. Thus, luxations without laceration of ligaments may arise from paralysis of such muscles as naturally strengthen a joint, as we find exemplified in two cases recorded by Sir A. Cooper. (Surgical Essays, Part ii. p. 10.) Another modern writer also remarks: "From the extent of relaxation, that I have sometimes observed in the ligaments of the large joints, there seems to be ground for believing, that complete, as well as incomplete luxation, may in some cases occur at the shoulder, without laceration of the capsule, particularly as there is demonstrative evidence of its occasionally taking place in the hip-joint." See Practical Obs. in Surgery, &c. by John Howship, p. 464. 8vo. Lond. 1816.

‡ Boyer, Traité des Maladies Chir. t. iv. p. 280. I infer that the latter part of the following statement must be a mistake: "The round ligament has a tendency to prevent dislocations in all directions, but particularly the dislocation downwards." A. Cooper's Surgical Essays, Part i. p. 26.

§ The description given by Mr. Howship of some preparations in Mr. Heaviside's museum, does not appear to me to warrant the inference, that, in these particular cases, which were all of them unreduced dislocations upward and backward, the ligamentum teres had not been ruptured. This conclusion can hardly be admitted from a mere view of the dried bones, unaccompanied with that ligament. Neither does the account, which Mr. Howship has given of another preparation in the same collection, amount in my mind to a satisfactory proof, that, in the luxation of the thigh-bone there alluded to, the fabric of the joint was entire in respect to the ligaments. However, lest what I now say may be incorrect, I should wish the candid reader to consult Mr. Howship's work, "Practical Observations in Surgery and Morbid Anatomy," pp. 465—478. &c. Delpech mentions some rare examples, in which the ligamentum teres was not torn in the luxation upwards and backwards, and other instances, in which it was ruptured in the dislocation upon the obturator foramen. See Précis des Maladies reputées Chirurgicales, t. iii. p. 110.

One of the most frequent luxations of the thigh is that in which the head of the bone is thrown upon the obturator foramen, viz. downwards and forwards. Flajani ‡, Callisen §, and many other distinguished surgeons, regard the dislocation in this direction as the most common. Their accuracy, however, must be doubted; for, Boyer assures us, that the dislocation upwards and backwards on the ilium, is as often met with as that downwards and forwards on the obturator foramen, and in his own practice has occurred with even greater frequency.‖ While Mr. Hey has seen only three luxations upon the obturator foramen, he has met with seven upwards and backwards.¶ I have not seen more than eight dislocations of the thigh, of which number only two were upon the obturator foramen. Sir Astley Cooper, whose statements are generally founded upon ample experience, concurs with Boyer and Hey in representing the luxation on the dorsum of the ilium as the most frequent.**

The following are the symptoms of a dislocation upon the obturator foramen: a hard tumour, caused by the lodgment of the head of the thigh-bone upon the obturator externus muscle and obturator ligament, may be felt at the inner and upper part of the thigh towards the perineum. According to Sir Astley Cooper the limb is two inches longer than the other.†† According to Mr. Hey, three or four inches.‡‡ The generality of surgical writers represent the toes and knees to be turned outwards; §§ an effect, which is ascribed to the tension and elongation of the muscles concerned in rotating the limb in this direction. There appears, however, to be no regularity attending the position of the toes. In the cases which fell under the notice of Mr. Hey, the foot of the affected limb was not turned outward.‖‖ The foot, says Sir Astley Cooper, though widely separated from the other, is generally turned neither outwards nor inwards, although he has seen a little variation in this respect in different instances: he thinks, therefore, that the position of the foot does not mark the accident, the diagnostic symptoms being the bent position of the body, the separated knees, and the increased length of the limb.*

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* On Dislocations, p. 56. ed. 4.

† Vol. cit. p. 283.

‡ Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 62.

§ Systema Chirurgiæ Hodiernæ vol. ii. p. 585. 8vo. Hafniæ, 1800.

‖ Traité des Maladies Chir. t. iv. p. 280.

¶ Hey's Practical Observations in Surgery, p. 314. ed. 2.

** Surgical Essays, Part i. p. 27.; also on Dislocations, p. 53.

†† On Dislocations, p. 56.

‡‡ Practical Obs. in Surgery, p. 321. ed. 2.

§§ Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 64.; Boyer, Traité des Maladies Chirurgicales, t. iv. p. 285.; C. Bell, Operative Surgery, vol. ii. p. 275., &c.

‖‖ A degree of ambiguity is thrown upon Mr. Hey's statement, by his adding "with respect to the knee;" but, as the toes can never be turned out *with respect to the knee*, in a mere dislocation of the hip, I conclude, that the expression has been inadvertently employed.

While the knee and foot of the luxated limb are widely separated from the other member, the upper part of the affected thigh is nearer to the opposite thigh than natural, and the trochanter major less prominent. The glutæi muscles are drawn downwards, put upon the stretch, and considerably flattened. The pyriformes are elongated and tense. Hence, the limb is drawn away from its fellow, and cannot be put near it without great difficulty. The triceps is also in a state of considerable tension, forming a hard mass, which reaches from the os pubis to below the middle of the thigh. The bent position of the body, specified by Sir Astley Cooper as one of the most constant symptoms, is owing to the tension of the psoas and iliacus internus muscles. When the case is examined, as the patient stands up, the thigh seems evidently more forward than usual.

Whether the foot be somewhat inclined outward, or not, in the dislocation upon the obturator foramen, the case cannot be mistaken for a fracture of the neck of the thigh-bone, because this last accident is never attended with any elongation of the limb, but almost always with a manifest shortening of it.

The dislocation of the head of the thigh-bone forwards and upwards upon the os pubis, is considered by Sir Astley Cooper as more easy of detection than any other luxation of the thigh. The limb is an inch shorter than the other; the knee and foot are turned outwards; and cannot be rotated inwards; but, there is a slight flexion forwards and outwards, and in one instance, which had been long unreduced, the motion at the knee backwards and forwards was full twelve inches. The striking criterion of the case is the facility with which the head of the thigh-bone may be distinctly felt upon the pubes, above the level of Poupart's ligament, and on the outer side of the femoral artery and vein.†

In this kind of dislocation, the head of the thigh-bone rests upon the horizontal ramus of the os pubis, and, in old unreduced cases, dissections prove, that it even tears up Poupart's ligament so as to get between it and the last mentioned bone, occupying a situation also between the sheath of the crural vessels and the anterior inferior spinous process of the ilium.‡ According to Boyer, when the displacement is recent, the head of the os femoris lies between the os pubis, and the mass common to the psoas and iliacus internus muscles, which is raised up by it. The upper portion of the capsular ligament and the ligamentum teres are lacerated.* The glutæi, pyramidalis, gemelli, obturatores, and quadratus, are tense and elongated, while all the other muscles about the joint are relaxed. Boyer says, the femoral vessels and anterior crural nerve are pushed inwards, and perhaps at the same time lifted up by the head of the bone; but, as this state of parts is not specified in the account given by Sir Astley Cooper of a case dissected and preserved in the museum at St. Thomas's hospital, this part of Boyer's description needs confirmation. He allows, however, that the compression of the vessels and nerves is never powerful enough to cause risk of gangrene, when the reduction is delayed; a truth well proved by the three unreduced cases which fell under the notice of Sir Astley Cooper. †

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* Surgical Essays, Part i. p. 37.

† Ibid. p. 45. and On Dislocations, p. 83.

‡ A. Cooper, Surgical Essays, Part i. p. 46.

This last species of dislocation is mostly occasioned by some violent effort, by which the os femoris is forced backwards, and the pelvis forwards. It may take place when a person puts his foot into some unexpected hollow in the ground, and his body at the moment is bent backwards.

The most frequent dislocation of the head of the thigh-bone is upwards and backwards upon the dorsum of the ilium, under the glutæus minimus. According to Sir Astley Cooper, the limb is from one inch and a half to two inches and a half shorter than the other, and the toe rests against the tarsus of the other foot. The knee and foot are turned inwards, and the knee is a little advanced upon the other; the latter effect arising from the tense state of the triceps and gracilis. When an attempt is made to separate the dislocated from the sound limb, it is found to be firmly fixed in its new situation, with respect to any movement, or rotation outwards, but the thigh can be slightly bent across the other. The constant rotation of the member inwards is ascribed by surgical writers to the lower and inner portion of the capsular ligament remaining entire, and keeping the fore-part of the trochanter major close to the acetabulum. ‡ Unless much blood be effused under the skin, the head of the bone can be felt moving upon the dorsum of the ilium, when the knee is rotated inwards; the trochanter major is much nearer the spinous process of the ilium, and less prominent, than natural.

In a fracture of the neck of the thigh-bone, the knee and foot are generally turned outwards; the trochanter is drawn backwards; and the limb can be readily bent towards the abdomen, although with some pain. But, what particularly merits attention, is that the limb, which is shortened from one to two inches by the contraction of the muscles, can be made of the same length as the other by a slight extension, and, when the extension is discontinued, the leg is again shortened. When the limb is extended and rotated, the surgeon may also feel a crepitus, which cannot be perceived while the limb is moved in the shortened position.*

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* A. Cooper, Surgical Essays, Part i. p. 46.

† Surgical Essays, Part. i. p. 45.

‡ Delpech, Précis Elementaire des Maladies Chir. tom. iii. p. 112.

A dislocation of the os femoris downwards and backwards must be exceedingly rare, if it occur at all; for, it appears from the statement of Sir Astley Cooper, that no case of this kind has occurred in his own private practice, or at St. Thomas's or Guy's hospital, during the last thirty years; and hence, he is inclined to doubt the possibility of the accident.† He remarks, that the dislocation on the ischiatic notch has been incorrectly described by writers, all of whom, as far as he knows, represent the limb as lengthened. The error, he says, must have arisen from their having examined the pelvis separated from the skeleton, and seen that the ischiatic notch was below the level of the acetabulum, when the pelvis was horizontal; but, he observes, that, in the natural oblique position of the pelvis, the notch in question is above the acetabulum, at least as regards the horizontal axis of the two cavities.‡ What Boyer says about luxations downwards and backwards so far concurs with the observations of Sir Astley Cooper, that primitive dislocations in this direction are represented as in all probability never taking place; because they could not happen, unless the thigh were bent and carried inwards further than the resistance of the trunk and opposite member would allow. However, the Baron is of opinion, that such displacement of the head of the thigh-bone may occur consecutively, and follow the luxation upwards and outwards, when the thigh by any cause is put, after this accident, in a state of flexion and adduction. Under these circumstances, he thinks it possible for the head of the bone to slip downwards in front of the upper part of the ischiatic notch §; but, that it can never glide down as low as the junction of the ilium with the ischium, much less below this point.

With regard to the prognosis in luxations of the thigh, it embraces the consideration of the bad symptoms which may originate from the injury; the difficulty of reduction; and the consequences, when the head of the bone is left unreduced. In reflecting upon the strength of the hip-joint, and the number and force of the surrounding muscles, one might be led to suppose, that the head of the os femoris could not be displaced from the acetabulum, without great mischief being done to the soft parts, followed by severe symptoms. In this respect, however, experience proves, that dislocations of the femur are not attended with more danger than those of the shoulder. After the reduction, the pain and swelling generally soon subside; and in about eight or ten days, the patient is sometimes able to walk again.* But, though the generality of cases are not followed by such inflammation, as occasions any important consequences, we learn from a practical work, that suppuration may take place after the reduction, and the patient die.† Even when the case is not reduced, the pain and swelling commonly soon go off, and the limb gradually regains some power of motion.

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* A. Cooper, Surgical Essays, Part i. p. 28.

† Ibid. p. 27.

‡ Op. cit. Part ii. p. 13.

§ Sir Astley Cooper would not regard this case as strictly a dislocation *downward* and backward, because in the natural position of the pelvis, the level of the ischiatic notch is rather higher than that of the acetabulum.

The reduction of luxations of the thigh-bone at the hip is attended with more difficulty, than that of the generality of dislocations. The distance, to which the head of the femur is removed from the acetabulum, and the large number and strength of the muscles, almost constantly make the business of reduction troublesome. The degree of difficulty, however, varies in different cases and different individuals. In thin, weak, delicate persons, the head of the bone can be replaced with much less trouble than in strong athletic subjects, whose muscles are capable of making vast resistance. The dislocation downwards and inwards, and that upwards and inwards upon the horizontal branch of the os pubis, are generally more easy of reduction, than the case upwards and backwards.

Recent luxations at the hip are more easy to reduce, than such as have existed some time, many of which indeed are quite irreducible. A question here arises, what is the period, at which an attempt at reduction becomes useless, and all chance of success is at an end? This is a question, to which, in the present state of surgical knowledge, an exact answer cannot be given. The records of surgery furnish one extraordinary instance, in which a luxation at the hip was successfully reduced, after it had continued two years, the nature of the accident not having been previously made out. ‡ I believe the attempt at reduction will hardly even succeed after three months. Two cases of late reduction are mentioned by Sir Astley Cooper: in one, Mr. Bennett, of Chester, replaced the head of the femur, after it had been on the dorsum ilii two months, the object having been materially promoted by the effects of opium, bleeding, and nauseating doses of the tartrite of antimony. The reduction, however, was followed by an inflammation of the hip, of which the patient had not recovered at the time when Mr. Bennett reported the particulars. The other example of late reduction was sent to the Medical and Chirurgical Society by Mr. Tripe, of Plymouth: the bone had been out of its place seven weeks.* The period, when all chance of success ceases, probably varies in different individuals; for, in one case related by Sir Astley Cooper, every attempt at reduction was found unavailing after five weeks. †

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* Boyer, Traité des Maladies Chir. tom. iv. p. 290.

† A. Cooper's Surgical Essays, Part i. p. 5.

‡ See Guyenot, Mémoire sur les anciennes Luxations; Mémoires de l'Academie de Chirurgie, tom. v. 4to. After a careful perusal of the case, here adverted to, I am disposed to think, that the particulars given by the author make out an example of diseased hip-joint where the event was favourable, rather than the reduction of a luxation of the head of the thigh-bone at the end of two years. With respect to another instance of supposed reduction by the effects of an accidental fall, after the bone had been out of its place five years, I join Sir Astley Cooper in believing a mistake must prevail in the account. On Dislocations, p. 91. ed. 4.

Leaving a dislocation of the thigh permanently unreduced, is a mistake of the most serious nature, as it renders the patient a cripple for life. An unreduced dislocation of the femur, however, does not make the patient for ever afterwards absolutely incapable of standing or walking, though it disqualifies him from doing so with any degree of ease. Nothing can be more interesting to the philosophical surgeon, than the observation of the efforts, which nature is constantly making for the reparation of injuries affecting the human body, and, perhaps, if there are any examples, which more strikingly, than others, illustrate such efforts, I believe they are to be found in cases of unreduced dislocations of the hip. Here the changes, wrought by the hand of nature, are truly surprising, a new socket being gradually constructed‡ for the displaced head of the bone, and the patient recovering the power of standing and walking, at first upon crutches, and at length with a stick, or even without any such assistance.§

With the view of promoting the reduction of the dislocation upwards and backwards, Sir Astley Cooper recommends free venesection, and then placing the patient in a warm bath at the temperature of 100°, and gradually increasing the heat of the water, until he begins to be faint. While he is in the water, he is also to be given a grain of tartarized antimony every ten minutes, until nausea is excited, when he is to be removed from the bath||, put between blankets, and placed on a firm table, or a mattress on the floor, in order that the displaced bone may be put back into its socket. There can be no doubt, that the means here advised will facilitate the reduction. The bleeding in particular seems quite proper as a general practice, because it may have an additional good effect in preventing subsequent inflammation of the soft parts about the in-

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* A. Cooper, Surgical Essays, Part ii. p. 17, 18.

† Op. cit. Part i. pp. 25.

‡ The new cup, which is thus formed, sometimes so completely surrounds the neck of the bone, as to prevent its being removed from it without fracture. A. Cooper, Surgical Essays, Part i. p. 7.

§ The limits of this work prevent me from entering into a particular description of the changes which happen when dislocations of the femur are left unreduced; but I feel pleasure in referring to some modern publications, in which the subject is considered; Boyer's Traité des Maladies Chir. t. iv. p. 294., &c. 8vo. Paris, 1814; Sandifort's Museum Anatomicum, vol. i. fol. Lugd. 1793; A. Cooper, Surgical Essays, Part i.; Howship's Practical Observations in Surgery and Morbid Anatomy, 8vo. Lond. 1816.

|| A. Cooper, Surgical Essays, Part i. p. 30. This employment of venesection, the warm bath, and emetics, was also particularly recommended by Loder. (See Chir. Med. Beobachtungen, i. b. p. 170. 8vo. Weimar, 1794.)

jured hip; and I think, therefore, that it should only be dispensed with in persons whose constitutions are not in a state to bear the loss of blood without serious detriment. But, with regard to the warm bath and nauseating doses of tartrite of antimony, proper as they are in cases of difficulty, it may be questionable, whether they ought always to be put in practice before any attempts at reduction are made, because the bone may frequently be replaced with moderate trouble, and then some delay and a good deal of annoyance will be avoided. However, when the first endeavours of the surgeon do not succeed, the propriety of weakening the patient, not only by bleeding, but also by the warm bath, and nauseating doses of tartrite of antimony, cannot be doubted. Also, whenever the bone has been some days, or weeks, out of its place, more trouble than usual is to be expected, and, therefore, every possible means of incapacitating the muscles, by bringing on a temporary prostration of strength, would then be right. In common instances, I should be content with bleeding the patient, and then proceed without further loss of time to the reduction.

In the dislocation upwards and backwards, the patient is to be laid on his back upon a large firm table, strong four-posted bed, or the floor, with a mattress, or blanket under him. The pelvis must be fixed by proper means, or, what amounts to the same thing, counter-extension equal to the extending force must be performed by the assistants. These last very necessary proceedings are fulfilled by means of a sheet, which is to be folded longitudinally, its middle being applied between the pudenda and the thigh, and its two ends being either fastened to some immoveable point, generally to the bed-post, or leg of the table on the opposite side, behind the patient's head, or given into the hands of the assistants who are to make the counter-extension. This is the method usually selected in this country. In France, surgeons fix the pelvis, or make the counter-extension, by placing the middle of the sheet between the pudenda and the upper inner part of the sound limb, taking care to interpose soft materials, in order to prevent the ill effects of pressure. One end of this sheet is carried over the groin, and the other over the buttock, and, where they both meet over the crista of the ilium, they are twisted together, and then given into the hands of the assistants. The evident advantage of thus applying the sheet for fixing the pelvis, or making the counter-extension, is that its ends are more out of the surgeon's way, and cannot slip, so as to form any hindrance to the reduction. When the counter-extending sheet, or girt, is applied in this manner, however, it is so far out of the line of extension, that, unless another contrivance be also adopted, the side of the pelvis, on which the dislocated bone is situated, would be drawn downwards by the extending force. The second contrivance here alluded to, is another sheet, or table-cloth folded longitudinally, or any broad strap, or girt, the middle of which is to be applied just below the crista of the ilium on the injured side, and the ends carried round to the opposite side of the pelvis just above the crista of the ilium, where they are to be twisted together, and then put into the hands of one or two of the assistants, whose duty it is to draw them at the time of the reduction in the direction in which they have been placed. I believe, unless two sheets, or girts, be thus used for fixing the pelvis, the object can never be strictly answered, though often in a sufficient degree to enable the surgeon to effect the reduction. In all difficult cases, however, the best plan is to make the counter-extension perfect by employing a folded table-cloth, or band, for effectually hindering all yielding of the pelvis on the injured side.

The French surgeons apply the extending means just above the malleoli, and thus have the advantage of a very long lever, which, at a certain period of the extension, is sometimes of considerable utility in facilitating the inclination of the head of the bone in the most desirable direction. However, whether the extension be made thus low down, or, as is customary in England, just above the condyles of the femur, flannel or some other substance should be interposed between the limb and the sheet, band, or strap, with which the extension is to be made, so that the part may not be chafed or injured by the pressure. For making the extension, Sir Astley Cooper prefers pullies, and, when the reduction is attended with difficulty, no one can doubt their advantage. The following are the principal directions, which he gives for the reduction of the dislocation upwards and backwards. The patient may be placed between two strong posts, about ten feet from each other, in which two staples are fixed; or rings may be screwed into the floor, and the patient be placed upon it. If two convenient posts for the staples can be found, the patient is to be put upon his back on an intermediate table, over which a thick blanket is spread. Then a strong girt is to be passed between his pudendum and thigh, and fixed to the staple behind the patient's head. Just above the knee a wet linen roller is then tightly applied, over which a leather strap is buckled, having two other straps with rings at right angles with the circular part. The knee is to be slightly bent, but not quite to a right angle, and brought across the other thigh a little above the knee.* The pullies are then to be attached to the other staple, and to the strap above the knee. The surgeon is now slightly to draw the cord of the pulley, and when he sees that every part of the bandage is upon the stretch, and the patient begins to complain, he is to wait a little, and allow the muscles to become fatigued. He is then to draw again, and having thus increased the extension a little more, he is not to pull the cord further, but wait a short time again, in order to let the muscles yield. He is to proceed in this gentle and gradual manner, until the head of the bone is felt descending. When it reaches the head of the acetabulum, he is to desire an assistant to take hold of the cord of the pulley, and keep up exactly the same degree of extension, while he himself is now to rotate the knee and foot gently outwards, and, as this is done, the bone slips into its place. In the foregoing method, the return of the head of the bone into the acetabulum does not generally cause any noise, the muscles being too much fatigued to produce this effect. When there is difficulty in getting the head of the femur over the brim of the acetabulum, the former is to be lifted up by placing the arm under it near the joint.*

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* In reducing a luxation upwards and backwards, Boyer says "L'extension sera faite obliquement de dehors en dedans, et un peu de derrière en devant." Tom. iv. p. 301.

The dislocation upwards and backwards cannot be conveniently reduced, while the patient lies upon the opposite side, because this position interferes with the extension made across the other limb.

When the thigh-bone is dislocated forwards and downwards upon the obturator foramen, the reduction may be performed while the patient lies either upon his back, or his sound side, and one chief object is to make a lever of the bone itself. A sheet, or table-cloth, longitudinally folded, is placed under the bone a little way below the trochanters, and being properly drawn towards the outside of the limb by an assistant, after due extension has been made, it serves as a fulcrum, on which the head of the bone may be moved into the acetabulum. Extension is to be made with the thigh at a right angle, or inclined somewhat less than a right angle to the trunk of the body†; then, while an assistant draws towards the hip the sheet placed a little below the trochanters, the surgeon is to make a lever of the bone by moving the condyles of the bone towards the other knee, or the ankle of the dislocated limb towards the other foot.

In general nothing can be more simple and easy, than the reduction of a dislocation upon the obturator foramen. If the case be recent, the head of the bone may sometimes be replaced, as Sir A. Cooper has explained, by merely putting the patient in the recumbent posture, separating the thighs as widely as possible, and fixing the pelvis with a girt between the scrotum and upper part of the thigh, after which the bone will slip into its socket, if the surgeon move the ankle of the dislocated limb over the opposite leg. “ In this case, the patient might have the thigh fixed by the bed-post ‡, received between the pudendum and the upper part of the limb, and the leg be carried inwards across the other. But, in general, it is required to fix the pelvis by a girt passed around it, and crossed under that which passes around the thigh, otherwise the pelvis moves in the same direction with the head of the bone.” § And, in those cases, in which the dislocation has existed for three or four weeks, Sir A. Cooper thinks it best to place the patient on the opposite side, fix the pelvis, and make a lever of the bone, much in the same way as I have already described. "Great care (he says) must be taken not to advance the leg in any considerable degree, otherwise the head of the thigh-bone will be forced behind the acetabulum into the ischiatic notch, from whence it cannot be afterwards reduced.

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* A. Cooper, Surgical Essays, Part i. p. 31.

† Hey's Practical Obs. in Surgery, p. 319. ed. 2. Boyer directs the extension to be made obliquely from within outwards. The head of the thigh-bone being already lower than the acetabulum, it is plain, that extension, made in a line corresponding to the axis of the body, must tend to increase the displacement.

‡ As practised by the late Mr. Hey. See his Practical Observations in Surgery, p. 321. ed. 2.

§ Surgical Essays, Part i. p. 39.

With respect to the dislocation upwards and inwards upon the os pubis, it is generally very easy of reduction. According to Boyer, the extension should be made in a direction nearly parallel to the axis of the trunk. Sir Astley Cooper recommends the patient to be laid upon his side on a table, and a girt, which is to be applied between the pudendum and inner part of the thigh, is to be fixed to a staple, a little before the line of the body. The pullies are to be fixed just above the knee, as in the dislocation upwards, and the extension is to be made in a line behind the axis of the trunk, the thigh-bone being drawn backwards. The extension having been continued for some time, an assistant is now to press on the pelvis, while with a napkin, laid under the upper part of the thigh, the head of the femur is to be lifted over the pubes and edge of the acetabulum.*

DISLOCATIONS OF THE PATELLA.

The generality of writers on surgery speak of luxations of the knee-pan in four directions, viz. upwards, downwards, outwards, and inwards; but, in the first two examples, the displacement of the bone is merely a consequence of another accident, namely, the rupture either of the tendon of the extensor muscles of the leg, or of the ligamentum patellæ. † According to many authors ‡, a dislocation of the patella inwards happens more readily, than that outwards. Mr. C. Bell § says, this bone is most frequently displaced inwards, owing to the lesser elevation of the inner condyle. Before the publication of the early editions both of the Dictionary and of this work, I had seen several cases of dislocation of the patella outwards, but never a displacement inwards, and I had therefore no hesitation in believing, that the first case is by far the most frequent. The difference of my account from that given by Mr. C. Bell, however, has attracted the notice of Mr. Dunn, of Scarborough, who remarks, in a letter written to me some time back, that, "on examining the bone (the femur) I should have been led to form your conclusion, owing to the greater magnitude of the inner condyle; but, on looking at the anterior and articular surface of the femur, I find, that the elevation is certainly less, and as such, I should conjecture, displacement inwards would be more easily produced." The anatomical fact, the lesser elevation of the inner condyle, is the circumstance, that has led writers into a mistake on this point. The opinion, founded on this consideration, Boyer observes, is refuted by experience, which proves the greater frequency of the dislocation outwards; and no doubt, says he, this is owing to the inner edge of the patella projecting more than the external, so as to pass considerably beyond the articular pulley of the femur, and, consequently, be more exposed to such force as is calculated to propel it outwards.* The ample experience of Sir Astley Cooper also confirms the fact of the greater frequency of the displacement of the patella outwards, though his description of the mode in which the accident is usually produced, is different from that of some other eminent surgeons: he observes, that the most frequent cause of the accident is from a person, in walking, or running, falling with the knee turned inwards, when the action of the muscles, in the effort to prevent the fall, draws the patella over the external condyle of the os femoris. The displacement, he says, generally occurs in persons who have some inclination of the knees inwards, which deformity disposes the patella to slip outwards during the action of the extensor muscles of the leg.† According to Boyer, both the dislocation outwards and that inwards are mostly caused by some external force, which propels the knee-pan in one of these directions; but, says he, great relaxation of the ligamentum patellæ, and a particular conformation of the condyles of the femur, may cause such a disposition to the accident, that the bone may slip out of its situation, without any outward force, from the mere contraction of the muscles. A girl came to Sir Astley Cooper's house, who had the power of throwing her patella off the condyles of the femur. Her knees were bent considerably inwards, and when the rectus muscle acted upon the patella, this bone was drawn from its natural situation into a line with the tubercele of the tibia, and laid nearly flat upon the side of the external condyle of the thigh-bone. She had been brought up as a dancing girl.‡ The same practitioner also details cases, in which the ligament of the patella was so considerably relaxed, after an accumulation of fluid in the knee-joint, that the bone was subject to displacement from the simple action of the extensor muscles of the leg.*

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* A. Cooper, in Surgical Essays, Part i. p. 46.

† Writers also speak of cases, in wich the patella is placed with one of its edges perpendicularly in the articular pulley of the femur, though there is some difficulty in conceiving, how the tendon of the extensor muscles of the leg, and the ligamentum patellæ can yield sufficiently to allow this rotation of the bone, much less that in which its front surface is turned completely backwards. Boyer, t. iv. p. 350.

‡ "Patella interdum in interiorem, rarius in exteriorem partem ab injuria quadam externa e sede naturali propelli potest." Callisen, Systema Chir. Hodiernæ, vol. ii. p. 592. 8vo. Hafniæ, 1800.

§ Operative Surgery, vol. ii. p. 279.

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* Traité des Maladies Chir. t. iv. p. 549.

† Surgical Essays, Part ii. p. 57. This gentleman, in the first part of his work, relates some cases of luxation outwards from relaxation of the ligamentum patellæ; but has not specified any example of luxation inwards either in his first or second volume. The several instances reported by Valentin, Ravaton, Itard, and Boyer, were all outwards. I conclude, therefore, that the dislocation inwards is uncommon.

‡ Examples of a similar nature are mentioned by Itard (Journ. de Méd. de MM. Corvisart, Leroux, &c. t. i. p. 516.) and by Boyer. The latter author considers

When the knee is considerably bent, a luxation of the patella cannot happen, because then the tendon of the extensor muscles and the ligamentum patellæ, keep this bone too firmly lodged in the depression between the condyles of the femur for any displacement to happen from external violence. But, if the leg be extended, or the knee only slightly bent, the connections of the patella are relaxed, it becomes more prominent, and its mobility is so much increased, that it is liable to be displaced either outwards, or inwards, according to the direction of the striking force.†

In the dislocation outwards, which is the most common, Boyer differs from some other writers in representing the displacement as seldom complete, because the force which is applied, is rarely great enough to push the bone entirely off the articular pulley of the femur. In this circumstance, says he, the patella does not remain, as might be imagined, in its natural transverse position; but its anterior surface is turned a little inwards, and its posterior surface in a similar degree outwards, its inner edge inclining backwards, and lodging in the articular pulley itself, while its outer edge is turned somewhat forward.

The accident is attended with the following symptoms: the leg is extended, and cannot be bent without seriously increasing the pain, which the patient already suffers; the inner margin of the articular pulley, off which the patella has slipped, can be plainly felt under the skin; over the outer part of the same pulley, the patella itself forms a remarkable swelling, and the outer edge of this bone is quite perceptible. Were the luxation complete, the extended position of the leg, the depression in the natural situation of the bone, the facility of distinguishing the articular pulley, and the tumour caused by the luxated bone itself upon the side of the outer condyle, would leave no chance of mistaking the nature of the accident.

A dislocation inwards may happen, when an external force propels the outer edge of the patella in this direction; but, the case is hardly ever complete.‡ The patella forms a considerable prominence upon the internal condyle; its front surface is inclined outwards, and its posterior one inwards; while its outer edge is turn-

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this tendency to spontaneous luxations of the patella outwards always owing to a defective shape of the articular surface, combined with a lax state of the ligamentum patellæ.

* Surgical Essays, Part i. p. 8.

† Boyer, Traité des Maladies Chir. t. iv. p. 350.

‡ "On n'a point observé un semblable déplacement de la rotule vers le côté interne du genou." Delpech, Precis Elem. t. iii. p. 126.

ed backwards, and its inner one forwards. In the depression observable in the situation, from which the patella is removed, the outer condyle may be plainly felt with the finger. The leg is extended, and an attempt to bend the knee produces a great increase of pain. Were the luxation inwards complete, the case would be sufficiently manifest, by the depression in the natural place of the patella, and the extraordinary prominence occasioned in its new situation.*

Dislocations of the patella are not generally attended with risk of serious consequences, and when the extensor muscles of the leg are completely relaxed, and sufficient pressure is employed, the reduction is perfectly easy. † However, if the violence applied should have been very great, the injury done to the ligaments of the joint may be far more dangerous, than the mere displacement of the patella itself. Boyer says, that he has never known of any case, in which a dislocated patella was left unreduced, and, therefore, he cannot pretend to describe the exact state in which the patient would be likely to be; though he conceives, that the flexion of the knee would be imperfect, and the joint weakened. Mr. Dunn, of Scarborough, to whom I feel indebted for several valuable communications, gave me an account "of a person at Pickering, who from an oversight of the surgeon, has had a dislocation of the patella outwards for twenty years. The anterior part of the knee is soft, and filled with a fluid, (lately requiring blistering to keep it down.) The patella lies on the outside and back of the external condyle of the femur. When he walks, he has a short stick to assist him. The limb seems to be raised by the flexors alone. As his knee is slightly bent, he rests upon his toes, and performs a sort of skipping, or jerking motion. He cannot raise his leg while sitting."

From what has been already said, it is evident, that in some cases, merely extending the leg, without bending the thigh at all on the pelvis, will not enable the surgeon to reduce a dislocated patella. Hence, the practice, inculcated both by Boyer and Sir Astley Cooper, is the same as that particularly recommended by Valentin: the latter says, the patient should be placed in a recumbent posture, and an assistant is to raise the leg, by lifting it at the heel. The extensor muscles being thus fully relaxed, the surgeon is to press down that edge of the patella which is most remote from the joint, whether the luxation be outwards, or inwards. This pressure raises the inner edge of the bone over the condyle of the femur, and the patella is immediately drawn into its natural situation by the muscles.*

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* Boyer, Traité des Mal. Chir. t. iv. p. 351.

† A case attended with some trouble, occurred in Mr. G. Young's practice, and is described by Sir Astley Cooper, Surgical Essays, Part ii. p. 58. An instance of similar difficulty is also recorded by Valentin. (See Recherches Critiques sur la Chirurgie Moderne.) The difficulty in both cases, however, only proceeded from the limb not being at first sufficiently elevated, and, as soon as the heel was raised up high enough to bend the thigh on the pelvis, as well as extend the leg, the patella was readily pushed back into its natural situation. Sabatier once appears to have failed to accomplish the reduction of a dislocation outwards, which Boyer afterwards rectified by attending to the perfect relaxation of the extensor muscles of the leg. See Boyer's Traité des Maladies Chir. t. iv. p. 359.

After the reduction, the joint should be covered with linen kept wet with a cold evaporating lotion; and other antiphlogistic means employed. When the swelling abates, a bandage is to be applied. Should any disposition to relapse exist, in consequence of a relaxed state of the ligamentum patellæ, or the shape of the condyles of the femur, a laced knee-cap would be of service.

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* A. Cooper, Surgical Essays, Part ii. p. 58.

THE END.

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5 — Hordeolum - tumours —